

PERSONAL COMPUTERS IN THE I.S. STRATEGY

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PERSONAL COMPUTERS
IN THE I.S. STRATEGY

DECEMBER 1982



PERSONAL COMPUTERS IN THE IS. STRATEGY

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I INTRODUCTION

A. SCOPE

- This report focuses on three primary issues:
 - What is the status of personal computers, and what are the factors that will affect future use?
 - What are the potential problems associated with personal computers?
 - What strategies should IS adopt to maximize personal computer benefits?
- Other important issues are only touched on briefly in this report since they will be addressed in depth in 1983 reports. These reports will include the following:
 - Supporting Personal Computer Software
 - This report is being prepared because many organizations are barely able to keep up with the explosion in personal computer hardware. Personal computer software will present an even greater explosion and a larger opportunity for success or disaster.



- Much packaged software for personal computers is inadequate. What can IS do to make sure that the right software is introduced and that it is used effectively? To what extent should IS develop personal computer software? What lessons learned on mainframe-based software are applicable and transferrable to personal computers?

- Organizing the Information Center

- One of the main themes in this report will be how Information Centers come to terms with personal computers, either by dividing functions or integrating personal computers into the Information Center network.

- Office Automation, DDP, Networking: Converging Issues?

- Office automation has been changed in the last year by the surge in personal computer use. Should personal computers and word processing equipment be used and controlled differently?
- Are there dangers in rushing to set up intraoffice and interoffice networks? Will office automation advances bring DDP back into the spotlight?

B. DEFINITIONS

- Throughout this report the term "personal computer" is used (often abbreviated to PC - no relation being meant to a particular device, the IBM PC). Other words or terms are sometimes used to denote the same general category, such as microcomputer, desk top computer, and small business computer. These words and terms have certain implications:



- "Microcomputer" is a very broad term.
- "Desk top" has a restrictive connotation.
- "Small business computer" suffers from the uncertainty of whether "small business" or "small computers" is being referenced.
- "Personal computer" grasps the essence of the revolution: A computer that an individual can use to the possible exclusion of everyone else. It is inexpensive enough that it can reasonably be assigned to and used by only one person (or at least a small number of people).
- INPUT's survey and research confirmed that PCs are, in fact, used with small groups, often being the "property" of one or two people.

C. METHODOLOGY

- The information in this report was based on a variety of sources:
 - INPUT conducted 185 interviews across a variety of industries to ascertain PC use and plans (see questionnaire extract in Appendix A).
 - Individual PC user experiences were ascertained in a number of personal contacts.
 - Information was obtained from over 100 PC vendors by means of personal interviews, trade show interviews, and vendor product literature.
 - Other data and observations were obtained from (and shared with) the team preparing a companion INPUT report in the Information Services Industry Program, Personal Computer Software Market Opportunities.



- o The recommendations contained in this report (especially Chapter VII) represent a composite of the best practices observed, described, and recommended in the course of this report.
 - Few, if any companies, have yet adopted even a majority of the recommendations contained in this report, although a number are considering such changes.
 - INPUT will be pleased to serve as a clearinghouse for companies' experience in dealing with the PC phenomenon.

D. REPORT ORGANIZATION

- The remainder of this report is organized as follows:
 - Chapter II is a management summary.
 - Chapter III reports the current and future status of PCs within corporations, focusing on uses and expected growth.
 - Chapter IV looks at technical issues, including current and expected hardware and software developments.
 - Chapter V examines PC general issues affecting IS, including the relation of IS objectives and the PC as well as potential PC problems.
 - Chapter VI examines the different roles which IS can play in future PC developments.
 - Chapter VII recommends a particular approach, that of coordinator, and suggests processes for attaining IS objectives.



II MANAGEMENT SUMMARY

- Most corporations are in the midst of a personal computer (PC) explosion. Some do not realize it yet. Over three-quarters of departments using PCs began doing so in the last year; over 40% began using them in the past six months.
- User satisfaction with PCs is extremely high. Current users plan to increase their PC use significantly in the next five years.
 - PC hardware expenditures are forecast to increase at an annual rate of 42% to 1987.
 - PC software is forecast to increase at an annual rate of 47% in the same period.
- PCs are used in a large variety of applications. Users value their low cost, speed of implementation and, most of all, the control they provide.
 - PCs are already viewed by users as a replacement for commercial timesharing. Many also see PCs as an alternative to centrally supplied IS services, as shown in Exhibit II-1.
 - Because of this, some IS managers see PCs as competitors or, at least, something to be carefully controlled.



EXHIBIT II-1

CHARACTERISTICS OF COMPUTING ALTERNATIVES FROM THE
USER'S VIEWPOINT

CHARACTERISTIC	COMPUTING ALTERNATIVES		
	PERSONAL COMPUTER	COMMERCIAL TIMESHARING	IN-HOUSE TIMESHARING / INFORMATION CENTER
Initial Entry Cost (For a Department)	Low	Very Low	Very Low
Operating Costs (For a Department)	Very Low	High*	Medium
Corporatewide Costs	Medium to High	High*	High*
Demands on User Personnel	Medium to High	Low to Medium	Medium
User Control	High*	Medium to High	Medium
Application Flexibility	Medium to High	Medium to High	Medium
Features Available	Medium to High	High	Medium
Response Time Consistency	High*	High*	Medium*
Application Tailoring			
Implementation Speed	High*	High*	Low to Medium
Cost	Low to Medium	High*	Medium to High
Ease of Use	Medium to High	High	Low to Medium*

* Key Factors Determining Acceptance



- Rapidly advancing PC technology almost certainly forecloses the ability of IS to stem the flow of PCs into an organization.
 - Mid-level systems, which now cost \$3,000 to \$5,000, will drop to half or less than that by 1985.
 - Very impressive "super-micros," now available and delivering one MIP of processing power, will be available as a packaged system (CPU and hard disk) in 1985 for under \$10,000.
- However, all is not smooth sailing in the PC world.
 - There are simply too many PC hardware vendors. A substantial portion of them must fail in the next few years.
 - There is too much unsatisfactory PC software; it will have to be selected carefully.
 - There is a grave danger of incompatible hardware and software being selected in a corporation due to PC users making independent purchasing decisions.
 - PC users may repeat the mistakes made with mainframe systems a generation ago and have insufficient internal standards and documentation.
 - The individual costs of PCs are low; the corporate total may be high. Every corporation should take steps to ensure that proper value is being received for the time and dollars spent on PCs.
- An information systems department is the logical organization to direct PC usage. IS has a choice of roles:



- Controller.
- Specifier.
- Coordinator.
- Information provider.
- Informal advisor.

- Exhibit II-2 describes each level of involvement.
- INPUT recommends the "coordinator" role, which will involve IS in a large number of activities:
 - Vendor selection.
 - User groups.
 - Information exchange.
 - Standards and guidelines.
- Exhibit II-3 shows the relationships and complexities of the coordinator role.
- It is important that standards be adopted cooperatively. It is also important that the standards be monitored and enforced.
 - Exhibit II-4 shows the general process.
 - IS should exercise caution, though, that it does not become or seem to become, the enforcer. This responsibility should best be left to enforcement specialists, such as the purchasing and internal audit departments.



EXHIBIT II-2

LEVELS OF PERSONAL COMPUTER INVOLVEMENT

CATEGORY	TYPE OF INVOLVEMENT
Controller	I.S. seeks to plan and control PC use as if PCs were extensions of the central I.S. department. <u>Comment:</u> Usually not feasible, although some I.S. departments would like it to be.
Specifier	I.S. seeks to define what departments can and cannot do with PCs and how the departments should proceed. <u>Comment:</u> Attempted in some companies/industries. Difficult to maintain in face of extreme PC dynamism.
Coordinator	I.S. seeks to guide, not dictate, PC direction. Sometimes viewed as second best to specifier or controller. <u>Comment:</u> An unfamiliar role for many I.S. departments.
Information Provider	I.S. makes a conscious effort to become involved in PC area but not to direct. <u>Comment:</u> May be the only feasible path where the company is very decentralized or I.S. is fighting fires on many fronts. Value of this approach should not be discounted: knowledge is power.
Informal Advisor	I.S. or individual I.S. staff members assist departments and people as requested. Knowledge base and, consequently, assistance are spotty. <u>Comments:</u> May be sufficient in a small, backward organization.



EXHIBIT II-3

THE PERSONAL COMPUTER COORDINATOR AND PERSONAL COMPUTER USERS

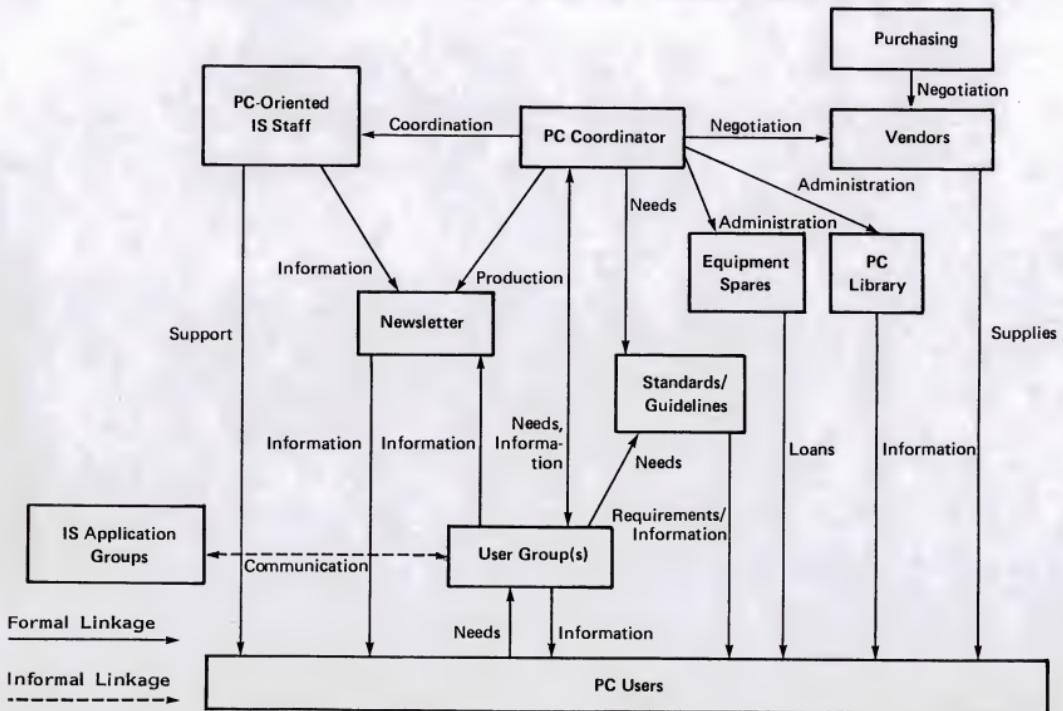
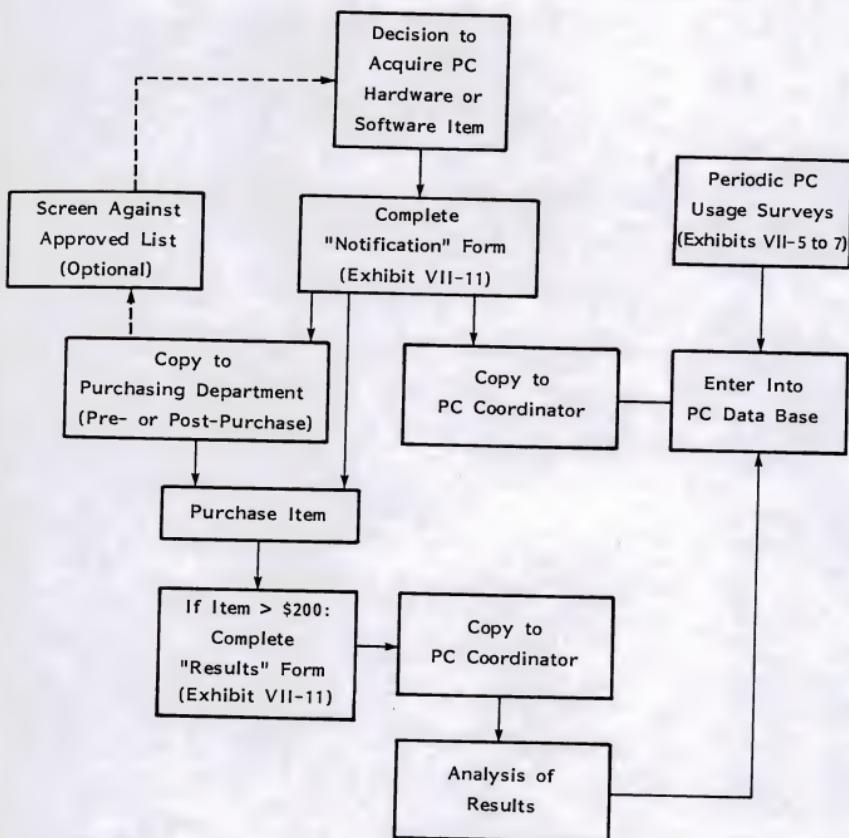




EXHIBIT II-4

MONITORING PROCESS





- To conclude:
 - PCs are here, and growing.
 - IS can play a critical role in ensuring that PCs are a positive force.
 - The time to start is now.



III CORPORATE USE OF PERSONAL COMPUTERS



III CORPORATE USE OF PERSONAL COMPUTERS

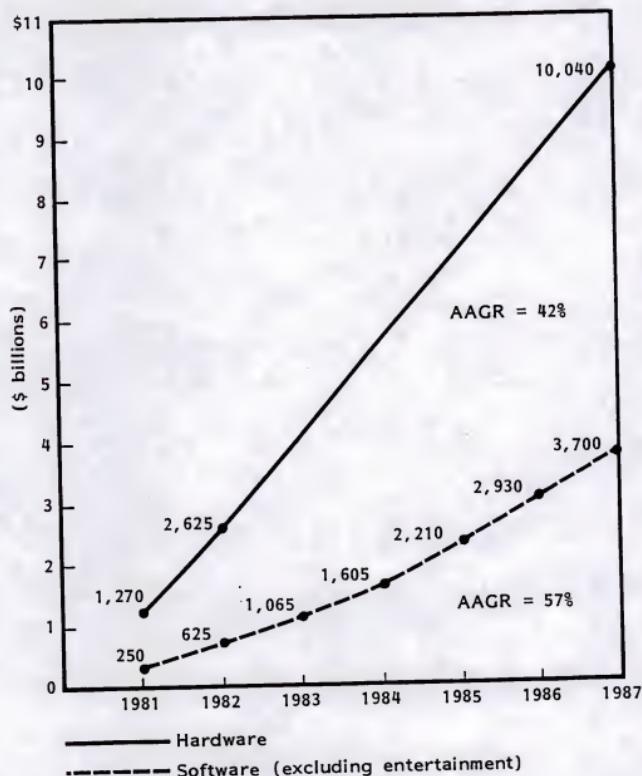
A. CURRENT AND FUTURE PERSONAL COMPUTER USE

- Personal computers are definitely a "hot item." The vendor community expects the PC hardware and software market to grow extremely fast during the 1980s, as shown in Exhibit III-1.
 - However, to keep these numbers in perspective, remember that in 1987 PC software expenditures will account for only one-seventh of total software expenditures, as shown in Exhibit III-2.
- There is no question that there is a tremendous increase in the usage of PCs in large companies. In INPUT's interviews, conducted during the summer of 1982, over three-quarters of the departments interviewed had made their first PC installation in the preceding 12 months, as shown in Exhibit III-3; only 7% had been using PCs for over two years.
- These are neophyte users, but very happy neophytes. The user departments report astonishingly high levels of satisfaction with their PCs and rate reliability equally high, as shown in Exhibit III-4. These very high levels of user satisfaction are unusual in INPUT's experience. New users of conventional systems often have mixed feelings about the new system.



EXHIBIT III-1

PERSONAL COMPUTER HARDWARE AND SOFTWARE EXPENDITURES,
1981-1987 (U.S.)



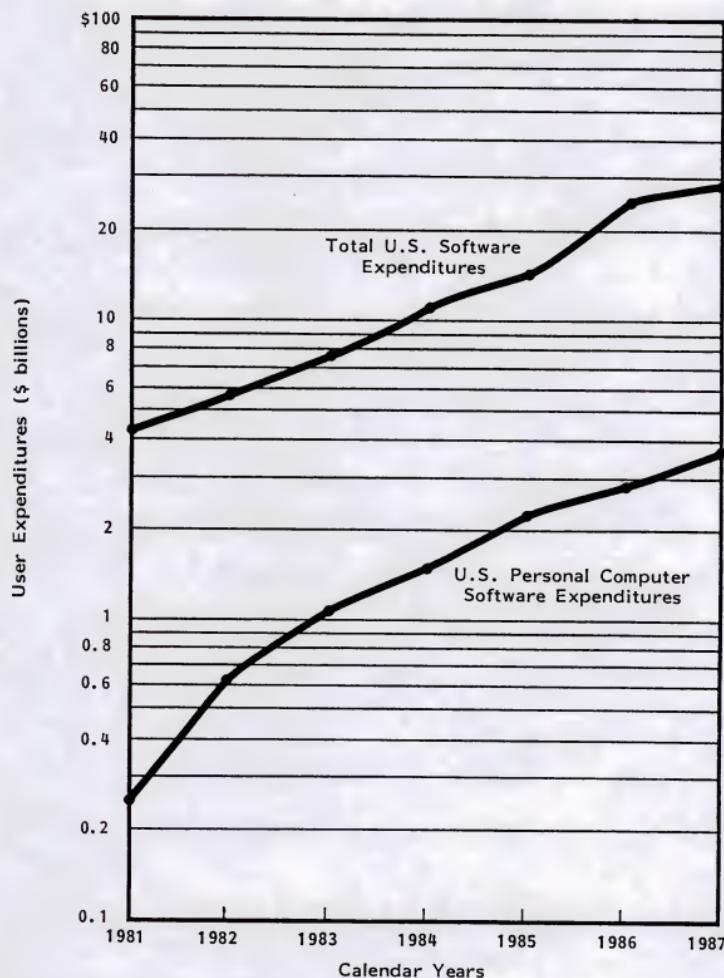
AAGR: Average Annual Growth Rate

SOURCE: INPUT Forecast



EXHIBIT III-2

RELATIVE SHARE OF PERSONAL COMPUTER SOFTWARE
TO TOTAL SOFTWARE PRODUCTS -
U.S. USER EXPENDITURES

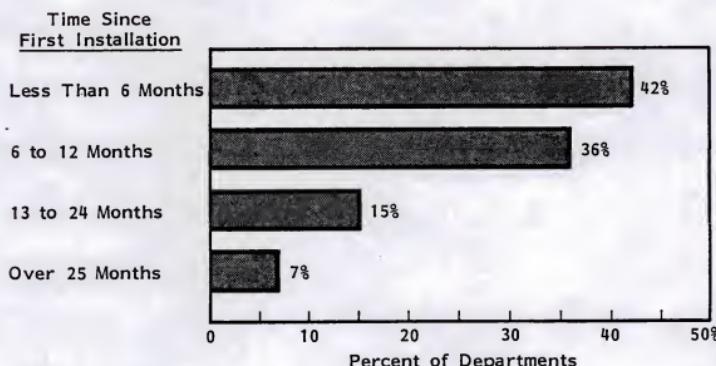


SOURCE: INPUT Forecast



EXHIBIT III-3

TIME SINCE FIRST PERSONAL COMPUTER INSTALLED IN DEPARTMENT

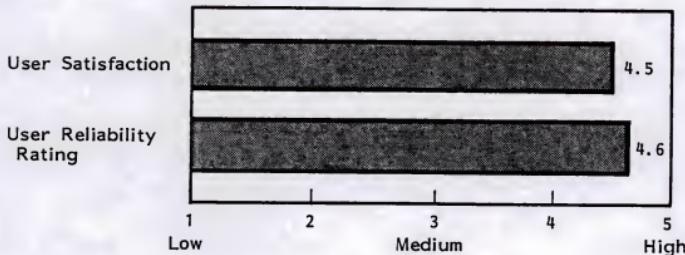


SOURCE: INPUT Survey



EXHIBIT III-4

USER SATISFACTION AND PERSONAL COMPUTER RELIABILITY



SOURCE: INPUT Survey

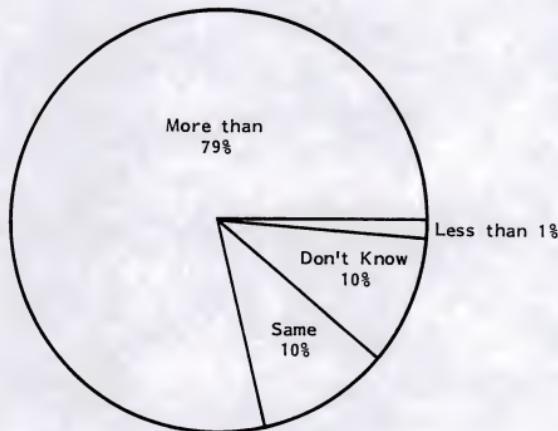


- Why is satisfaction so high? In discussions with PC users, the following points became apparent:
 - The PC-based solution is much better than what existed before (i.e., nothing or an inadequate manual system; not many PC systems so far are direct replacements for conventional computer systems).
 - PC software, especially the "Calc" family, is quite impressive for the price and is reasonably user friendly.
 - Solutions are fast: days or even hours. There are no feasibility studies, priority reviews, life cycle reviews, etc. This may be storing up trouble for the future, but no one in user areas cares very much yet.
 - Perhaps most importantly, PC systems belong to the users. They own them, control them, and can make them do just what they want (right or wrong). Furthermore, PC users are more inclined to overlook the defects of systems they developed themselves than those developed by, say, IS.
 - .. Some PC users are, for example, using VisiCalc to perform simple word processing and are quite satisfied with the results, even though they are aware of far more suitable word processing programs.
 - .. If such an ad hoc solution was supplied by IS or another outside source, there would be no end of complaints.
- It is not surprising that the great majority of present PC users foresee an increase in their use of PCs over the next five years, as shown in Exhibit III-5.
 - Many users volunteered that they saw their PC use increasing by several hundred percent in that period.



EXHIBIT III-5

EXPECTED LEVEL OF USE OF PERSONAL COMPUTERS
IN FIVE YEARS



SOURCE: INPUT Survey



- Most users already have plans for additional hardware, as shown in Exhibit III-6, and additional software, as shown in Exhibit III-7.
- About one quarter are planning to obtain customized software. (Currently, 22% have some specially written software.)

B. SPECIFIC TYPES OF USAGE

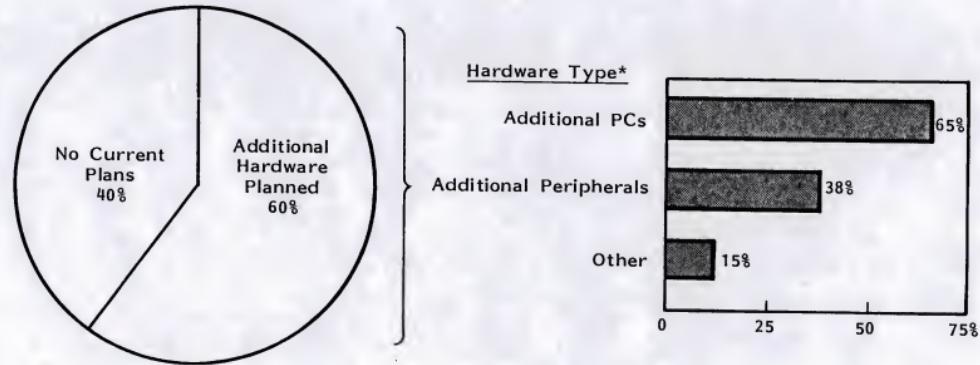
I. HARDWARE

- PC users are not adventurous when it comes to selecting hardware, as shown in Exhibit III-8.
 - Apple has about half the installations, but IBM is obviously closing fast and Tandy with the TRS-80 has a good foothold. It will be interesting to see if other entrants can squeeze their way in. (See Chapter IV for product and technical discussion.)
 - Apple and Tandy have been around longest. Both have considerable proprietary software; for a time one had to buy an Apple to get Visi-Calc.
- Over 90% of these PC systems have printers; they are not just super calculators.
- Of the departments interviewed, 62% also have a separate terminal tied into a large computer. This means that most PC users are acquainted with conventional computer solutions.



EXHIBIT III-6

USER PLANS FOR ADDITIONAL PERSONAL COMPUTER HARDWARE



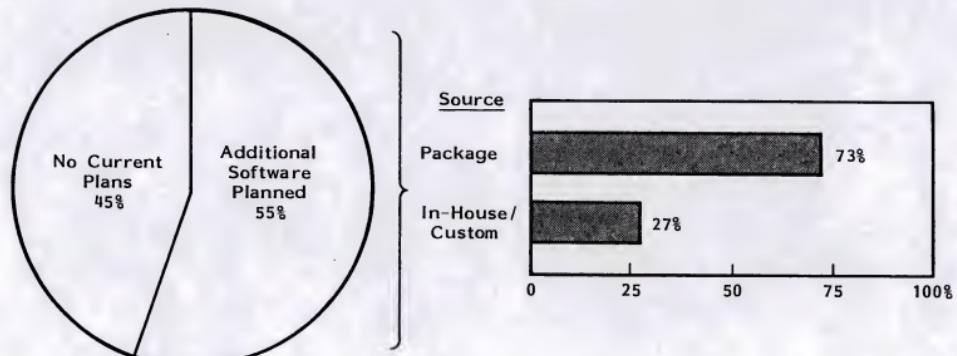
* Totals more than 100% because of multiple plans

SOURCE: INPUT Survey



EXHIBIT III-7

USER PLANS FOR ADDITIONAL PERSONAL COMPUTER SOFTWARE

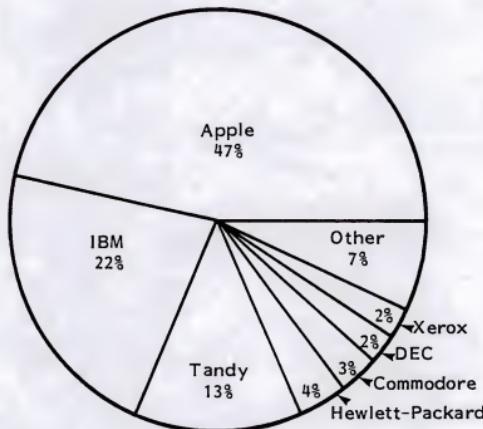


SOURCE: INPUT Survey



EXHIBIT III-8

PERSONAL COMPUTER HARDWARE USED



SOURCE: INPUT Survey



- However, the PCs themselves are generally used as standalone devices. Only one-fifth are capable of being tied by communications lines to other PCs or in-house or external mainframes.
- On the average, the departments interviewed have 35 employees and two to five PCs, i.e., seven to thirteen employees per PC.

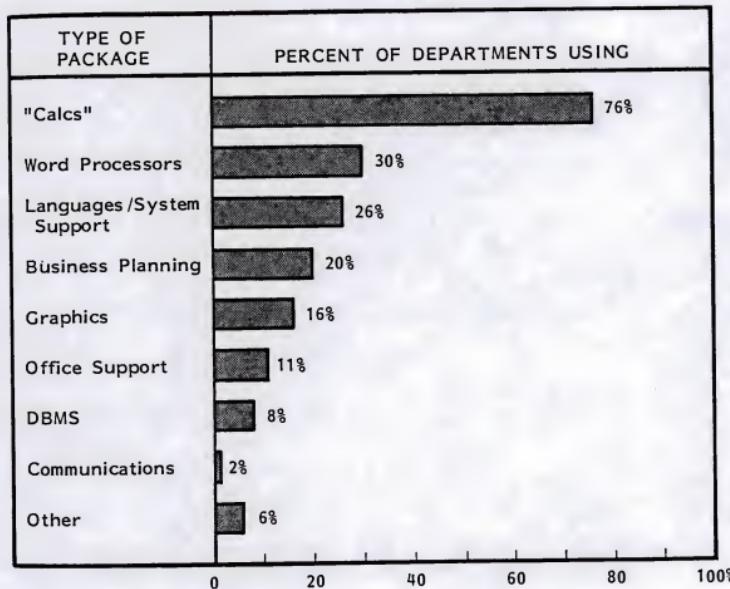
2. SOFTWARE AND APPLICATIONS

- VisiCalc and similar packages are used by over three-quarters of departments interviewed, as shown in Exhibit III-9. Other types of business planning packages are used by 20% of departments.
 - Fewer than one-third of the departments interviewed have a word processing package.
 - These are personal and professional machines. The chief users are not used to typing text.
 - Typing is already being handled in some other way.
 - PCs are still not as satisfactory as dedicated word processors for performing large-scale word processing. (This issue is discussed at greater length in Chapter V, Section C.)
 - The range of uses to which PCs are being put is quite impressive, as shown in Exhibit III-10 which classifies them by general categories. Exhibit II-11 shows the relative amount of use by category; no one area or group of areas stands out.



EXHIBIT III-9

TYPES OF PERSONAL COMPUTER SOFTWARE PACKAGES USED



SOURCE: INPUT Survey



EXHIBIT III-10

EXAMPLES OF PERSONAL COMPUTER APPLICATIONS

Budgeting and Accounting	Other Financial
Advertising Accounting	Actuarial Analysis
Budgeting	Amortization
Cash Administration	Billing
Cash Flow	Bond Issues
Cash Management	Bond Management
Consolidation of Subsidiaries	Debt Servicing
General Ledger	Debt Structuring
Profit Analysis	Demographic Studies
Profit and Loss	Depreciation Analysis
Subledger	Discounts
Modeling/Planning	Fixed Assets
Annual Plans	Float Reports
Actuarial Planning	Foreign Tax Computation
Cost Benefit Analysis	Interest Rates
Financial Analysis	Inventory
Financial Modeling and Forecasting	Investment Analysis
Purchase versus Lease Analysis	Invoices
Reforecasting	Labor Distribution
Regressions	On-Line Acquisitions
Service Planning Model	Payroll
Statistical Analysis	Portfolios
Trends Analysis	Purchasing
Yield Projections	Purchasing Study
	Rates Analysis
	Secondary Loan Analysis
	Tax Calculations

SOURCE: INPUT Survey

Continued



EXHIBIT III-10 (Cont.)

EXAMPLES OF PERSONAL COMPUTER APPLICATIONS

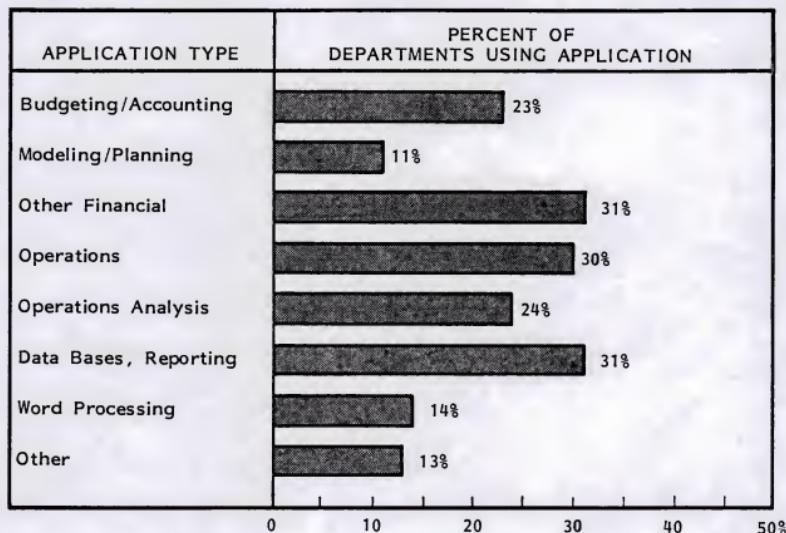
Operations	Data Base, Reports
Bill of Materials	Dow Jones Reports
Claims History	Energy Reports
Engineering	File Manipulation
Manager Performance	Historical Records
Merchandising	Job Descriptions
Order Entry	Marketing Research Histories
Process Control	Math Schedule
Record Verification	Molding Shop Reports
Relocation Files	Personal Statements
Sales Journals	Record Management
Sales Product Lists	Scoring Test Profiles
Scheduling	
Scheduling Factory Inventory Levels	Word Processing
Shipment Plotting and Information	
Operations Analysis	
Advertising Analysis	Contract Writing
Comparative Analysis	Mailing Lists
Fuel Analysis	Promotional Letters
Future Customer Work Analysis	Word Processing
Operating Expense Analysis	
Operations Simulation Training	Other
Pressure Calculations	Business Graphics
Price Development	Communications
Project Estimates	EDP Auditing
Sales Analysis	Library
	Real Estate Tracking
	Slide Production
	Software Reviews
	Text Equipment Design
	Time Management
	Used Equipment Survey
	Worksheets

SOURCE: INPUT Survey



EXHIBIT III-11

PERSONAL COMPUTER APPLICATIONS



SOURCE: INPUT Survey



IV TECHNICAL ISSUES



IV TECHNICAL ISSUES

A. OVERVIEW

- The PC started life in the mid-1970s as a bagful of parts which hobbyists assembled; data were input by toggle switches. In 1978, all of this changed, in large part due to the introduction of the Apple.
- The choices now available are mind boggling:
 - There are dozens of PC manufacturers offering over a hundred models. There are many hundreds, if not thousands, of hardware peripherals and other add-ons to choose from. New products (and companies) are announced every day.
 - There are at least 5,000 software packages (excluding games) for PCs and probably almost as many software firms, most of which are obviously very small. The next few years should see a tidal wave of PC software.
- Four principles should be kept in mind when examining the PC marketplace:
 - Technical innovation will continue to flourish. The statement "Next year's products will be better than this year's products" will be true for some time to come. This is not a reason to avoid action but is useful to know when assessing exciting, but untested, products.



- Hardware is much more advanced than software and will remain so for some time to come. Hardware and software are both more sophisticated than many PC users; however users will soon begin to close the gap.
- Hardware prices will fall in real terms and especially in terms of capabilities per dollar. Future software package price movements are much less clear.
- Many vendors (hardware as well as software) will not survive in the PC marketplace. Some will fall by the wayside because of inferior products; others, though, will simply not be able to gain enough market share to maintain a viable operation.
- It will not be enough to simply avoid smaller companies or newcomers; they are often the firms with the most attractive price/performance packages. As Apple and Osborne have proved, firms that are new and small can become large and well-established.

B. CURRENT PERSONAL COMPUTER SYSTEM OFFERINGS

- Because the PC market is new and quickly expanding, there is considerable confusion among both buyers and sellers as to what its boundaries are. Part of the confusion is caused by the tendency to use the terms "personal computer" and "microcomputer" interchangeably. Furthermore, the term microcomputer can be applied correctly to hardware systems priced from \$300 to \$30,000.
- Exhibit IV-1 shows the range of microcomputer systems categorized in four levels:



EXHIBIT IV-1

LEVELS OF MICROCOMPUTER SYSTEMS

CATEGORY	COMPONENTS	PRICE RANGE	EXAMPLES
Level 1 Home Systems	8-Bit CPU, Minimal Memory, Optional Monitor	\$300-1,500	T199, Commodore (Low End), Tandy (Low End)
Level 2 "Core" PC	8-Bit (soon 16-Bit) CPU, Floppy Disks, Monitor, Optional Dot-Matrix Printer	\$1,500-5,000	Apple II, IBM PC, TRS-80, Xerox 820, Commodore (High End)
Level 3 Large PC/Small Business Systems	16-Bit CPU, Hard Disk, Floppy Disk, Monitor, Letter Quality Printer	\$5,000-20,000	Apple III, IBM PC (With Third- Party Disks), Altos, Alpha-Micro, TRS-80 Model 16
Level 4 "Super-micro"	16- or 32-Bit High Performance CPU, Monitor Hard Disk, Tape Backup	\$20,000-30,000	Three Rivers, Charles River, Apollo

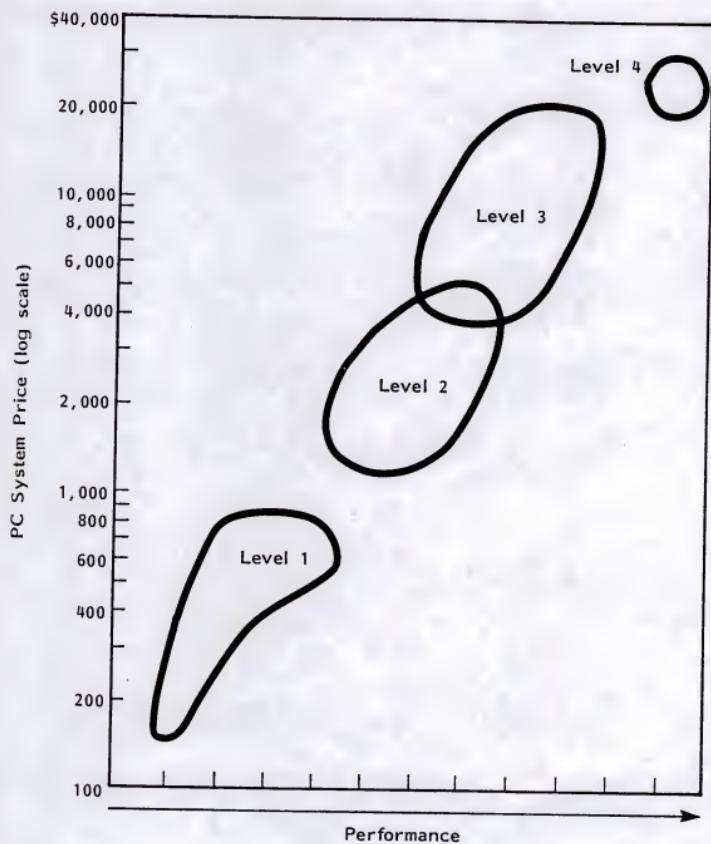


- Level 1 contains the machines that will be mass marketed this Christmas. The manufacturers hope that they will be upgraded by adding floppy disks, etc. However, in their present form most of these low-price machines are not suitable for business use; the Commodore business models are the only partial exception. These level 1 machines are not included in this report.
- Level 2 equipment is the true PC. These machines account for most current installations and perform creditably.
- Level 3 is a group in transition. In the last year, relatively inexpensive hard disks have been introduced as add-ons to level 2 machines or as the basis for higher performance systems in the \$5,000 to \$7,000 category.
 - . The fate of the traditionally more expensive small business systems (Altos, Alpha-Micro, etc.) remains to be seen.
 - . It is just a matter of time, in INPUT's opinion, before the level 2 users move up to the higher performance of the low end level 3 systems.
- Level 4 systems are now only curiosities to IS and average business users. Their target is scientists and engineers who need intensive processing, and system integrators who need a powerful centerpiece for their systems.
- The general relationships between price and performance of different level systems is shown in Exhibit IV-2.
 - Level 1 is isolated from level 2.
 - Level 4 represents a discontinuity between price and performance.



EXHIBIT IV-2

RELATIONSHIP BETWEEN DIFFERENT LEVELS OF
MICROCOMPUTER SYSTEMS: 1982





- Appendix B provides additional details on the price for representative systems from selected manufacturers at levels 2 and 3.
- Selected personal computer hardware and software vendors are profiled in Appendices C and D.

C. HARDWARE

I. PROCESSORS

- "First generation" PCs were 8-bit machines. The IBM PC set the pace for using 16-bit chips. In 1983 most of the machines aimed at the business market will be 16-bit machines.
 - Currently, the 16-bit machines' advantage over 8-bit machines is not too evident in practice since most software was designed for 8-bit machines.
 - Sixteen-bit machines have been forced to either have spare 8-bit chips for the old software or emulate the older machines. In either case, the true value of the newer technology has not been realized.
 - On the horizon are 32-bit machines (e.g., the Charles River Universe 68) that will be impressive performers indeed.
- Straight processing chips are not really a limiting factor any more. At second tier computer shows, for example, Z80A chips (a mainstay of 8-bit PCs) can be purchased at a display booth for \$3.50 each (you must buy at least eight, though).



- Special purpose chips (e.g., operating systems, VisiCalc, graphics fonts) will begin to be built into PCs or offered as add-ons.
 - This will be partly a marketing ploy and partly a means to protect software from being copied.
 - Functional chips will greatly improve performance as well as free the main memory.

2. PERIPHERALS

- Until recently, PCs were limited in their data storage capability - several hundred K of floppy disk storage. Now many PCs offer hard disk options.
 - Typically, sizes range from 4- to 12-megabyte Winchester disks with prices in the \$3,000 to \$7,000 range.
 - A few manufacturers are beginning to offer Winchester disks in the 20- to 32-megabit range, starting at \$6,000 (e.g., Fortune).
 - Vendors are predicting 100-megabyte disks soon at one end of the scale and super small 3-inch Winchesters at the other.
 - Vertically recorded floppies, with storage in the megabit range, may be offered soon.
- Winchester technology is far preferable to floppy disks in the office environment, not only because of storage capacity, but also because there are potentially many fewer mechanical problems.
 - Floppies are exposed to handling and other destructive forces because of their design. The floppy disk transport mechanism is similarly exposed to mishandling, dirt, and other contaminants.



- Floppies are still an order-of-magnitude cheaper, though, and for many applications, floppy technology is quite adequate.
- While Winchester disks are far more secure because of their sealed design, there are two problems:
 - There is often no backup when problems do occur. Several hundred floppies might be needed to back up one Winchester. Streamer tapes and removable disks are obvious answers but significantly add to PC investment. More important, many PC users have not learned the need for backup.
 - Another, potentially more serious, problem is that the long-term reliability of some vendors' mini-Winchesters is not known. Certain manufacturers have cast aspersions on the quality of the design and manufacturing of some of their competitors. Buyers would be well advised to thoroughly check the track record of all peripherals they acquire, especially disks.

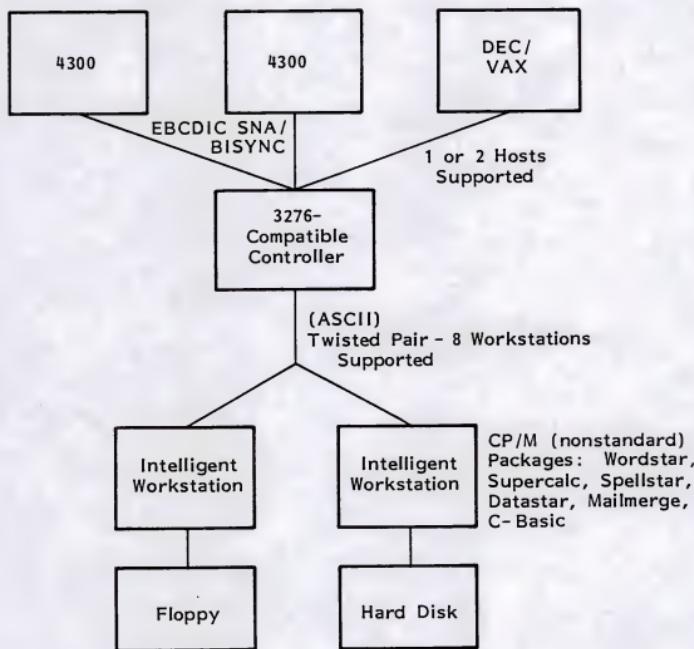
3. PERSONAL COMPUTERS AS WORKSTATIONS

- Most PCs can function as terminals after the addition of a modem and communications software (cost: \$200 to \$1,000 depending on sophistication). However, the PC usually loses most of its intelligence and local processing capabilities in doing so.
- At least one vendor (Beehive International) has recently announced a true dual-purpose workstation which combines a CP/M PC with 3270-compatible terminal, as shown in the system schematic in Exhibit IV-3.
 - The concept is quite interesting and would be useful for applications where a department regularly inputs data into a central system and/or has legitimate local processing needs.



EXHIBIT IV-3

DUAL PURPOSE WORKSTATION (BEEHIVE'S "TOPPER")





- Data can be staged, either upwards or downwards, in local disk storage. Packaged software supplied with the system can manipulate data before or after central processing.
- A limitation of the system is that it supports a proprietary variant of CP/M so that externally acquired CP/M programs may or may not work. This is a serious deficiency, although the vendor may be able to translate the programs.
- Another problem for IS departments is that a considerable amount of their time may be required to put the system in place (for both hardware and software). The user will find that this limits the looked-for PC flexibility.
- Similar implementations are sure to be announced soon, offering prospective users a different range of capabilities.

D. RESOURCE SHARING

- In the medium term, communications will probably not be from PC to mainframe, but from PC to PC. Most such communications will take place on the same site and a majority within the same department.
- This kind of local communication is not so much to send messages or exchange data as it is to share data. It is no coincidence that two of the major PC local area network vendors are also mini-Winchester vendors (Corvus and Nestar).
 - These vendors know that one of the biggest barriers to selling hard disks is their cost, which is probably more than the rest of a standalone PC system. Sharing disks means sharing costs.



- There are also good systems reasons for different users in the same department to share data. The rationale is basically the same as for a DBMS in mainframe systems.
- Sharing resources can be accomplished on different levels by having:
 - A single processor that allocates resources (IBM 360 architecture).
 - Multiple processors that go through a single controller.
 - Multiple processors and controllers (i.e., a local area network).
- These different approaches are shown schematically in Exhibit IV-4.
 - The second and third alternatives are those which are most suitable for the PC world.

E. SOFTWARE

I. SYSTEMS SOFTWARE

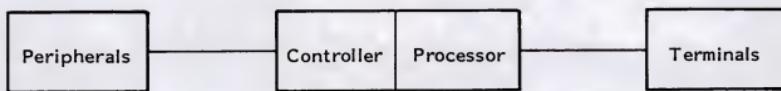
- PC operating systems are very different from mainframe operating systems in one important nontechnical respect: With two exceptions, operating systems are not proprietary to an individual manufacturer.
 - Admittedly, the exceptions (Apple and Tandy) are major ones. However, when the IBM PC entered the market with a choice of three operating systems (CP/M-86, MS-DOS, and UCSD p-System), it put the stamp of approval on "open systems."



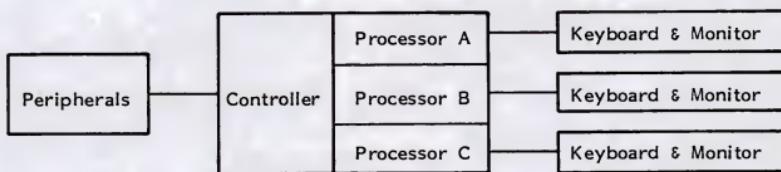
EXHIBIT IV-4

SHARED PERIPHERAL ALTERNATIVES

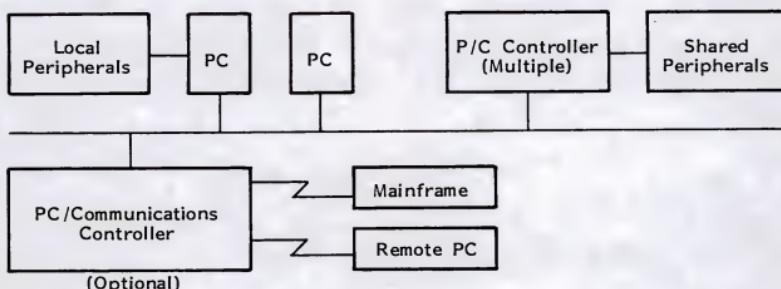
Time-Sliced CPU (360 Architecture)



Dedicated CPUs (Modular Computer)



Bus/Ring (Nestar, Corvus)





- This means that PC choice and compatibility (or incompatibility) exist on many levels. This is unlike the mainframe world where the initial choice of a particular manufacturer by a user makes (or forecloses) many other decisions.
- Exhibit IV-5 shows how the decisions run from the chip level to applications packages.
 - The same processor chip may be used differently by different manufacturers, e.g., for peripheral interfaces. (See examples for 16-bit machines in Exhibit IV-6.)
 - Standard operating systems (e.g., CP/M) will not necessarily perform the same way on different hardware implementations.
 - Applications programs are, of course, operating-system dependent, but they may also be hardware manufacturer dependent.
 - In addition, popular applications packages such as VisiCalc are often modified, by either third-party vendors or end users, for special purposes (e.g., real estate planning, construction bidding, etc.)
- These complexities mean that most applications packages have to be tailored or "tweaked" to run on different manufacturers' hardware, even where the same operating system (typically CP/M) is involved.
- Since CP/M's only real advantage is its age (which is also its main disadvantage), the times are ripe for a change. The two leading contenders are UNIX and the UCSD p-System.
 - UNIX has a devoted band of followers in the academic and scientific worlds. It is very attractive to the above average and intellectually adventurous programmer. UNIX may be too flexible (i.e., lacks secur-



EXHIBIT IV-5

LEVELS OF PERSONAL COMPUTER COMPATIBILITY

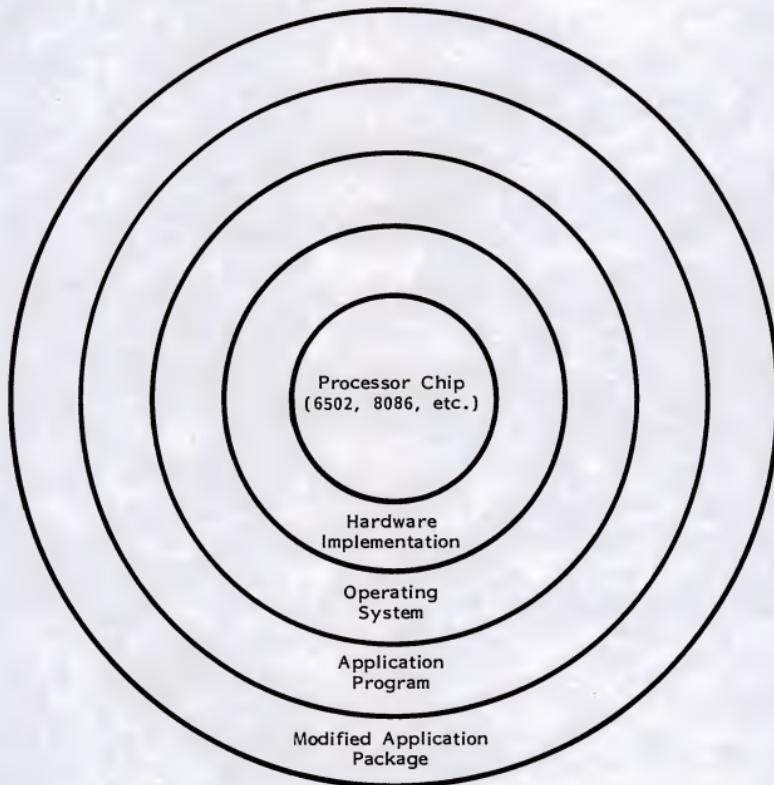




EXHIBIT IV-6

CHIPS FOR 16-BIT SYSTEMS
(Examples)

CHIP TYPE:	8088	8086	6800
Vendors	Commodore BX 256 DEC IBM PC North Star 8116 Vector Graphic 4 Victor	Eagle GRID NEC Wang Professional	Corvus Fortune TRS80 - Model 16



ity) and powerful for the typical commercial environment, especially for unsophisticated end users.

- There was something of a parallel between UNIX and PL-I, at least in PL-I's early days: PL-I's power was more than most programmers could comfortably handle. The restrictions of COBOL were far more congenial to coders and managers alike.
- UNIX may, however, be an attractive option for a firm's research staff who have the desire and ability to handle UNIX's demands. Coupled with the power of a "super-micro" (see section F of this chapter), UNIX could be a very cost-effective tool in that setting.
- The UCSD p-System is a transportable operating system. In theory, applications programs written in the p-System ("p" stands for pseudo-code) will be totally transportable across hardware manufacturers. Up to now the p-System has suffered from a chicken-and-egg problem:
 - While available for most hardware/operating system combinations, it has been a relatively expensive add-on (an end user would pay several hundred dollars more), and there has been relatively little applications software written for it.
 - Now that the p-System is one of the three chosen operating systems for the IBM PC, it has a mass market legitimacy not seen before. In addition, a substantial number of p-System-based packages are under development. 1983 should be a turning point year for the p-System.
 - If the p-System is accepted, then corporations will have a very attractive alternative to standardizing at the hardware level.



2. APPLICATIONS SOFTWARE

- Applications software is virtually divided into VisiCalc and everything else. While VisiCalc has several dozen "spreadsheet" package competitors (many of which are at least as good), it has solidly entrenched brand recognition: some users of non-VisiCalc spreadsheets sometimes refer to their package as "Visi-Calc."
- There are literally thousands of PC software packages for sale now; by the end of next year this number will have doubled. Many of these new products will be less than acceptable because most PC software products fail to meet one or more of the following tests:
 - Does the product in fact perform as required? Many PC packages are put together by a single person in that person's spare time. The product is often not comprehensive since it reflects only one person's, or a small number of people's, experience. Most PC software products are rushed to market before they are really ready and tested.
 - Is the product supported? Compounding the problem of inadequate products is the tendency to "kiss and run." Customarily, no after-sales support is guaranteed. Few PC software products even offer a maintenance contract. What you see is all that you're ever likely to get. The PC software industry has had more in common up to now with the record industry than the traditional software industry.
 - Will the vendor survive? Even the largest producers of PC software are quite small in terms of the number of their employees. Several successive product misjudgments or a falling out between partners can lead to the end of the company, or, at least, a restructuring that drops old products. Buyers will then be on their own.



- This picture may seem too gloomy. IBM, for example, has established fairly rigorous testing, acceptance, and documentation standards for the third-party software it distributes. However, even this is no guarantee that a firm will stay in business or support its products. More importantly, much software, even for the IBM PC is marketed through third-party channels. In the case of a vendor dropping out of the IBM PC market, another vendor (or IBM, possibly) might take over the product; but there are no guarantees.
- It is a fair comment that only a few applications software products will still be in existence and supported by their present manufacturer five years from now. But certain classes of products and companies will survive:
 - VisiCalc is certainly a product with staying power. Last year WordStar and its family of products might also have been included; however, the current problems of its distributor show that few firms in the industry are immune to financial problems.
 - Peachtree Software, having been acquired by MSA, is now in safe financial position. Its products are also being integrated with those of MSA.
- What is required on the buyer's part is common sense:
 - Standardize on certain products within a product class (e.g., one or two "Calcs" rather than six or eight).
 - Use software reviews and dealer tests to get a good idea of product capabilities.
 - Talk directly to the organization that will be supplying support (this could be either the distributor or the producing company). Make sure that the sole support is not a high school student available from 5 to 6 p.m.



- Contact current users to learn their experiences. If the local dealer or distributor cannot or will not pass on such names, look for another product.

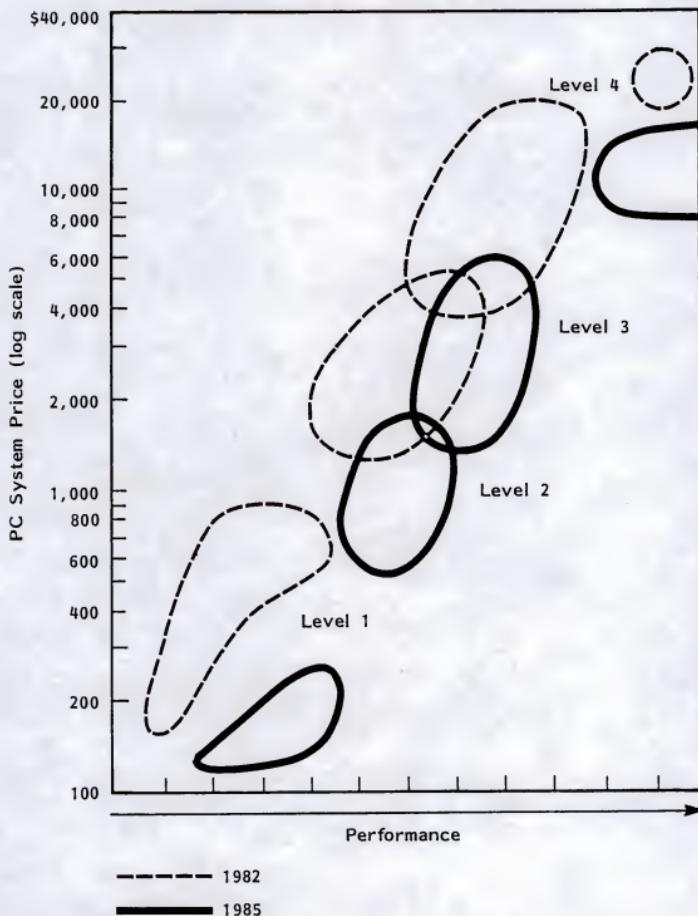
F. TRENDS

- Through the mid-1980s the PC market will be characterized by rapid pricing declines for a given level of performance combined with generally increased levels of performance.
- Redrawing the price-performance relationships of the four levels of PCs shown for 1982 in Exhibit IV-2, produces a different set of "footprints" for 1985, as shown in Exhibit IV-7.
 - Each footprint is somewhat smaller in the lower three classes as products become more standardized (e.g., virtually commodities).
 - Performance shifts to the right for all levels and prices come down.
 - The relative change in level 4 will in some ways be the most impressive: these systems will break the \$10,000 mark and offer performance characteristics now associated with mid-range minis (e.g., one MIP and up throughput).
- These level 4 systems are currently solutions looking for problems to be solved. They are already beginning to find acceptance in the scientific and research communities and many turnkey companies are looking at these systems with great interest. Special purpose systems can be packaged in these units at extremely attractive price-performance levels.



EXHIBIT IV-7

RELATIONSHIP BETWEEN DIFFERENT LEVELS OF
MICROCOMPUTER SYSTEMS: 1985





- The results of the collaboration between the super-micro makers and turnkey vendors should be apparent by 1984. The results could affect the entire IS strategy, because:
 - Extraordinary amounts of processing power would be offered directly to end users.
 - The traditional minicomputer would no longer have a rationale.
 - Smaller mainframes (up to the middle of the existing 4300 line) would be overlapped.
 - These supermicros could form the core of very cheap timesharing systems that could be rented to end users.
- A specialized use of the increased processing power of all levels of microcomputers will be the increased use of graphics, especially high resolution graphics. (For more detail, see INPUT's August 1982 report, Business Graphics: Boon or Boondoggle?)
- User needs and awareness will catch up with current PC networking capabilities. This will be aided by the dropping costs of hard disk storage and, possibly, by the introduction of videodisk storage for PCs.
- These will be the least relative changes (or improvements) in software:
 - A few more "household word" products will emerge.
 - All of the old operating systems will be with us, plus some new ones.
 - The market will still be knee-deep in products.



- Traditional hardware manufacturers and mainframe software vendors will have moved into the market in distribution and support roles.
- They will, however, mainly be resellers or acquire established products from small software houses.
- It will still be up to individual buyers to determine the worth of new software products.



V GENERAL ISSUES



V GENERAL ISSUES

A. THE RELATION OF IS OBJECTIVES AND THE PERSONAL COMPUTER

- IS management should clearly identify which of its primary objectives may be affected by the spread of PCs in their organization. IS will then be able to more effectively plan and implement the IS approach to PCs and at the same time deploy fewer resources to achieve IS goals.
- Four of the main IS objectives identified by INPUT in its research (see the 1982 ISP Annual Report) are:
 - Improving IS planning.
 - Increasing IS cost-effectiveness (much more important recently).
 - Extending IS computer power throughout the organization.
 - Expanding the IS contribution to achieve corporate goals.
- Each objective has specific tasks associated with it which will help achieve the objectives. These objectives and tasks are outlined in Exhibit V-1.



EXHIBIT V-1

I.S. OBJECTIVES AND TASKS

OBJECTIVES	COMPONENT TASKS
Improving I.S. Planning	<ul style="list-style-type: none">• Multi-year Strategies• Resource Allocation• Capacity Planning• Life Cycle Planning
Increasing I.S. Cost-Effectiveness	<ul style="list-style-type: none">• Chargeback Systems• Hardware Efficiency• Programmer Productivity• Replacing Outside Timesharing
Extending I.S. Computer Power throughout Organization	<ul style="list-style-type: none">• On-Line Systems• Dispersed Processing (e.g., 4300s)• Information Center• More Powerful Central Processors
Expanding I.S. Contribution to Corporate Goals	<ul style="list-style-type: none">• New, Improved Systems• User Agreements• Integration of I.S. and Corporate Planning• Better/Cheaper Operations Due to Computer Usage



- Most of these tasks will be affected by the widespread use of PCs, as shown in Exhibit V-2. It is important to note that the impact can be positive or negative.
 - The positive contribution can be significant.
 - PCs can add another layer of computing effectiveness to an organization.
 - PC applications development can be performed directly by the user resulting in faster, better, and cheaper systems (see the contrast between the chain of involvement in conventional and PC system development shown on Exhibit V-3).
 - PC applications can serve as prototypes for mainframe-based development.
 - PCs can widely distribute computing knowledge as well as computing use; hands-on experience in solving one's own problems is often worth far more than theoretical training.
 - On the other hand, PCs could become a destabilizing factor.
 - PC users could require immediate, unplanned IS assistance in difficult situations (e.g., an important control system that is ineffective).
 - PC applications could skim off in-house timesharing work, leaving high overhead and starting a vicious circle of further withdrawal and higher overheads. The later transfers to PCs might not be as satisfactory from the users' standpoint.



EXHIBIT V-2

IMPACT OF THE PERSONAL COMPUTER ON I.S. ACTIVITIES

TASK	PC EFFECT*	COMMENT
<u>I.S. Planning</u>		
Multi-Year Planning Strategy	M	<ul style="list-style-type: none"> Will be more complex with fewer EDP activities under direct I.S. control
I.S. Resource Allocation Planning	H	<ul style="list-style-type: none"> PCs can displace existing or planned I.S. systems and/or lead to further demand for I.S. systems
Capacity Planning	H	<ul style="list-style-type: none"> PCs can displace existing or planned I.S. systems and/or lead to further demand for I.S. systems
Life Cycle Planning	M	<ul style="list-style-type: none"> PC users will become impatient over lengthy cycle times, more knowledgeable concerning their system needs
<u>Cost-Effectiveness</u>		
Chargeback Systems	H	<ul style="list-style-type: none"> PC users will compare PC cost to I.S. cost for similar jobs
Hardware Efficiency	O	
Programmer Productivity	H	<ul style="list-style-type: none"> Users will be more knowledgeable PC systems can be prototypes
Replacing Outside Timesharing	H	<ul style="list-style-type: none"> PC use will often be more cost-effective; PCs will be able to handle increasingly complex applications In-house timesharing can be similarly affected

* O = No Short-Range Impact

M = Moderate Impact

H = High Impact

Continued



EXHIBIT V-2 (Cont.)

IMPACT OF THE PERSONAL COMPUTER ON I.S. ACTIVITIES

TASK	PC EFFECT*	COMMENT
<u>Computer Power</u>		
On-Line Systems	M	<ul style="list-style-type: none"> PCs can be terminals and local processors.
Dispersed Processing	H	<ul style="list-style-type: none"> Second- and third-generation PCs may compete with or complement I.S. - sponsored systems.
Information Center	H	<ul style="list-style-type: none"> PCs may replace or change the entire definition and implementation of the Information Center
Powerful Central Processor	O	<ul style="list-style-type: none"> PCs may have long-range effect on size and kind of central workload.
<u>Corporate Goals</u>		
New Systems	H	<ul style="list-style-type: none"> Some new systems may be partly or wholly PC based. PC work can serve as prototypes or concept tests.
User Agreement	H	<ul style="list-style-type: none"> Users will have actual or potential options in place of centrally supplied systems.
I.S./Corporate Planning Integration	O	
Better/Cheaper Operations	H	<ul style="list-style-type: none"> PCs will introduce many opportunities for improvement.

* O = No Short-Range Impact

M = Moderate Impact

H = High Impact



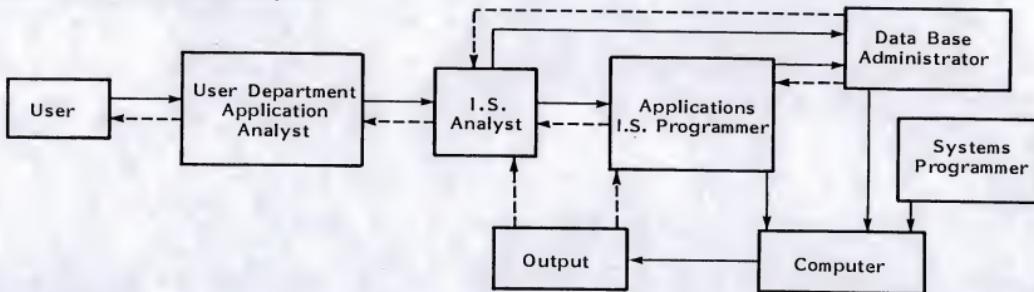
EXHIBIT V-3

PERSONAL COMPUTER AND CONVENTIONAL SYSTEM DEVELOPMENT CONTRASTED

PC System Development



Conventional System Development





- PC users could "know it all" and not accept IS feasibility findings, schedules, charges, etc.
 - PC-based systems could greatly increase costs while achieving few benefits.
- This last point is a key one and the main reason for IS to seek involvement in PC development and use.
 - Isolated or even widespread PC success will be attributed to the efforts of individual PC users.
 - Widespread PC failure, however, will often be seen as something that IS should have prevented whether or not IS has taken an active role. Much of the reason is simply the word "computer" in personal computer.
 - Systemic failure in utilizing PCs may occur even after (or because of) seeming initial success.
- The major impacts (for good or ill) of the PC arise from the same characteristics that make users want to join the PC club.
 - Relative ease of use by nontechnicians.
 - Speedy implementation.
 - Flexibility.
 - Small initial investment.
 - Local (individual or departmental) priority setting and control.



- PCs can be extraordinarily useful; however, they can also create significant problems for the using department, IS, and the corporation as a whole.
- The following section outlines the major problems that occur with PC use. The next chapter identifies the strategies that the corporation should adopt (with IS necessarily playing a leading role) to ensure that PC advantages are maximized and that the disadvantages are not allowed to become important factors.

B. POTENTIAL PERSONAL COMPUTER PROBLEMS

- The initial enthusiasm of PC use, sometimes to the point of euphoria, disguises the fact that many PC systems are now essentially fair weather systems. They have not been examined critically nor have they stood the test of time. The main potential difficulties on the horizon for PC systems involve:
 - Standardization.
 - Documentation.
 - Value produced in proportion to resources consumed.

I. STANDARDIZATION ISSUES

- This is the short-term problem. Once nonstandard systems or applications have become established, they are very difficult to eradicate. Standardization areas to be addressed include:
 - Hardware.
 - Operating systems.



- Applications software.
- Data.
- Interfaces.
- a. Hardware
- Incompatible hardware will be more likely as alternatives jostle the established "Big 3" (Apple, IBM, and Tandy). PCs like the Osborne are, in fact, very attractive. This makes the question of hardware standardization that much more difficult.
 - Where hardware is incompatible, it will cause long-term technical problems, including:
 - Interconnecting of systems.
 - Sharing peripherals.
 - Sharing software.
 - Sharing data.
 - Discounts and external support will be harder to arrange.
 - Perhaps most important, the PC users themselves will be fragmented into Apple camps, IBM camps, etc.



b. Operating Systems

- This is a problem that is unique to PCs. Except for Apple and Tandy (and they are important exceptions), the major operating systems are more or less hardware independent. Therefore, an alternative may be not to standardize at the hardware level but at the operating system level.
 - The same general types of problems arise with the use of nonstandard operating systems as those described above with nonstandard hardware.

c. Applications Software

- Here the problem is the plethora of applications packages which exist. There are, for example, several dozen packages that perform functions similar to VisiCalc, and more are on the way.
 - Automated file exchange between the different "Calc" programs is difficult and sometimes impossible.
 - Customized versions, sometimes called "templates," of "Calc" packages (done in-house or by outsiders) can be quite valuable.
 - Organizations with differing "Calc" packages are unable to get the most from their investments because templates cannot be shared.
 - Mutual learning and the exchange of ideas are hampered.

d. Data

- As central IS departments learned long ago, it is not enough for data to be similar in format or meaning; the data must be exactly the same in order to be combined or meaningfully compared.



- Some IS managers have worried about a special aspect of this problem:
 - PC users gaining access to the central data base and distorting the data or contaminating the main data base with bad data.
 - As Exhibit V-4 shows, this is merely one of the possibilities.
 - The current low use of telecommunications by PC users makes this, at most, a problem for the future.
- There is an equally serious and more likely problem: different departments might take data (e.g., financial, personnel, sales) they believed to be the same, but which were actually different, and from the data draw contradictory conclusions.
 - This is an often overlooked, but insidious, problem. By the time it surfaces, considerable management time will have been wasted, or worse, faulty decisions will have been made.
 - This is an area where PC education would be valuable. Users would learn the uses to which interdepartment and intersystem data can and cannot be put.

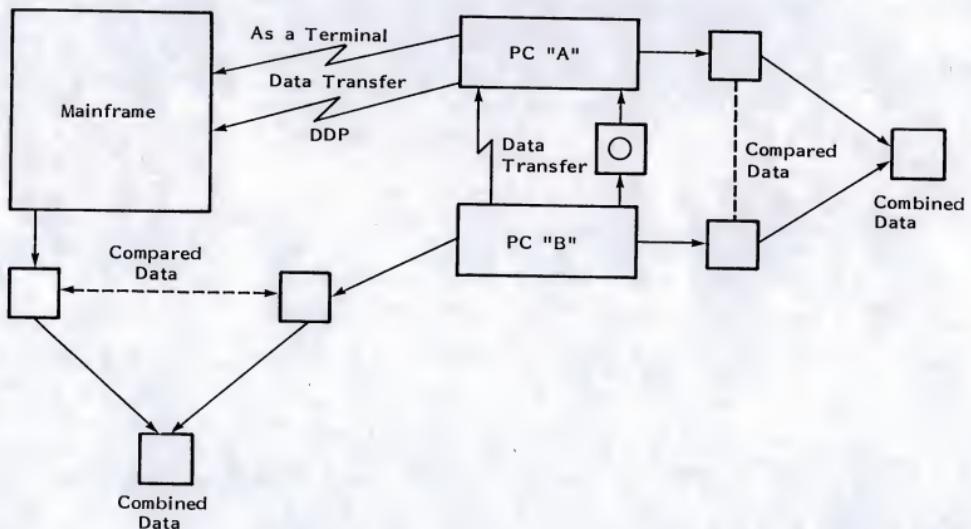
e. Interfaces

- Many of the data problems can also affect the establishment of communications interfaces. Communication protocols, hardware, and software must be compatible. The danger lies in setting them up independently because thereafter it will be impossible to establish a comprehensive PC network without undoing most of what has been done before.



EXHIBIT V-4

DATA EXCHANGE POSSIBILITIES





- Often hardware, software, and/or data inconsistencies will make even partial communications interfaces unfeasible.
- Where interfaces are snarled, the office of the future may be postponed indefinitely.

2. DOCUMENTATION ISSUES

- Documentation can be viewed as a subset of the standardization issue. Actually, the problem is more basic: little usable documentation of any kind exists.
- As IS staff has learned, the lack of documentation is not really a problem when systems are new; the original authors are still accessible and changes are few and simple.
- In addition, the entire PC community has become used to grossly inadequate documentation for commercial PC packages.
- Poorly documented PC applications (and this can include such basic documents as the setup instruction for loading data into an unmodified package) can have especially pernicious effects.
 - The identical wheel (e.g., a departmental budgeting program) will have to be reinvented in different departments or within the same department as time goes by.
 - A base of software cannot be successively refined but must be rebuilt from zero for each marginally different use.
 - This will add greatly to an organization's long-term PC costs, even though this kind of cost will usually be hidden. At the same time, the benefits of PC use will be reduced.



3. VALUE ISSUES

- The two preceding subsections showed how PC costs can become excessive and how shared functions may not be feasible economically (or at all).
- Even more dangerous are activities which may be computerized competently, but which provide little or no benefit to the organization. These include:
 - Activities which should be dropped completely (e.g., departmental systems which duplicate centrally provided systems).
 - Activities which should be resystemized before being computerized.
 - Activities best left manual.
 - Activities which, when automated, create additional work.
- This last point is especially important. This is the problem that has been created by many of the users of the office copier and office telephone networks. It is clear that organizations spend a great deal more time on these activities than in the days of carbon paper and central switchboards; it is arguable that the effect on many organizations has been to hinder true communication by making superficial communication easier.
 - Similarly, it is not clear that most organizations will make better decisions running, say, 100 simulations containing 50 variables as opposed to running 10 simulations with 15 variables. The former will consume much more professional time in producing and analyzing the number and perhaps leave less time to considering the effects of variables on their business (not to speak of implementing the decisions).



- To prevent this, the organization needs relatively simple checks and balances to assess the value received from PC use.

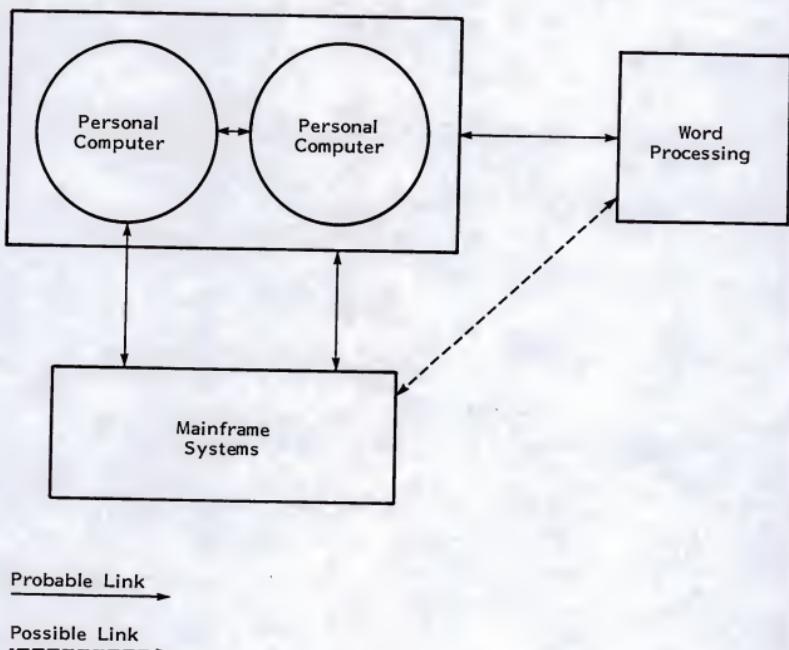
C. INTEGRATION WITH WORD PROCESSING AND MAINFRAME SYSTEMS

- In some respects, PCs are poised between word processors and mainframe systems.
 - PCs are often physically placed near word processors. Word processing software is widely offered for PCs (although, as shown in Exhibit III-11, it is not that widely used by many business users of PCs).
 - The primary functions of PCs, financial and operations analysis and control, duplicate what can exist, at least potentially, on a mainframe system. The data used are often a subset of that on mainframe systems (although now usually manually entered into the PC).
- These points raise obvious questions regarding the networking, or at least the sharing of data, between the three areas. Exhibit V-5 shows the possibilities of integration.
 - Word processor to mainframe ties are at least a logical possibility, but will not make much sense until cheap videodisk storage is available and then only for selected applications.
 - PC to PC integration is much more likely in the short run as individual departments begin to accumulate a number of PCs and find that they are increasingly working with the same data (or wishing they could).
 - These pressures will grow with the need to use attractively priced, but still somewhat expensive, peripherals. This includes hard disks, plotters, and specialized printers.



EXHIBIT V-5

POTENTIAL INTEGRATION OF PERSONAL COMPUTERS,
WORD PROCESSORS, AND MAINFRAME SYSTEMS





- PC to PC integration will be speeded by the common characteristics of hardware, applications, and users. The picture is much less clear, though, when looking at integration on a broader scale between PCs, word processors, and mainframe systems.
 - The processing power of PCs is now relatively low (although this should dramatically increase over the next five years). This puts them in between word processors on the one hand and mainframe systems on the other. (Mainframe systems, in this case, go down to the high end of the 4300 series; the low end may actually be overlapped by "super PCs" in a few years.)
 - Data storage tells a similar story: PCs are graduating from the floppy disk popularized by word processors to Winchester technology (and capacity).
 - Word processors have a peculiar need for "letter quality" output. This is much less of a need for the business PC user or for most mainframe applications.
 - Both PCs and word processors are almost always used in an interactive mode; much mainframe work is still batch or conversational.
 - The best word processors are strong ergonomically and very user friendly. This is their biggest advantage over PCs, which have not achieved as much as they could in this respect. Mainframe systems are generally not user friendly, reflecting their technical history; information centers are only a partial exception to this.
 - The ability to be flexible and change is the PC's strongest selling point now. Word processors are not meant to change, which accounts for their present superiority in their area of specialization. Mainframe



systems' size, complexity, and historic roots limit their ability to change easily or quickly.

- Most PC users are untrained; they often master the PC by brute force. Both word processing and mainframe users normally go through structured training programs. The training itself focuses on only a specialized activity.
- Intermediaries to perform work are very common on mainframe systems and are the rule in word processing. PC use, on the other hand, is largely one-on-one with a professional (often the ultimate user) involved.
- The characteristics of PCs, word processors, and mainframe systems, then, are quite different, as shown in Exhibit V-6. Straightforward integration seems out of the question for some time to come.
 - PCs and word processors may share storage and printers. However, the PC will try to monopolize storage and the word processor the printer.
 - There is much future in using the PC as a part-time terminal or in performing local processing for a central application (and/or download data for local manipulation). This can promote some hardware savings and improve data quality. It will, however, be done on a case-by-case basis.
- Integration is not yet a serious issue for most PC users. They have been PC users for too short a time for this to be near the top of their agendas.
 - As discussed in the previous chapter, the technology for integration is waiting (if not yet fully polished).



EXHIBIT V-6

CHARACTERISTICS OF PERSONAL COMPUTERS,
WORD PROCESSORS, AND MAINFRAME SYSTEMS

CHARACTERISTIC	IMPORTANCE TO:		
	PERSONAL COMPUTERS	WORD PROCESSORS	MAINFRAME SYSTEMS
Processing Power	Low/Medium (now) High (future)	Low/Medium	Very High
Data Storage	Medium/High	Low/Medium	Very High
"Letter Quality" Output	Varies	High	Low (usually)
Interactivity	High	High	Varies
User Friendliness/Ergonomics	Medium	High	Low
Changing/Flexible Uses	High	Low	Medium
Untrained Users	High	Low	Low/Medium
Prevalency of User Intermediaries	Low/Medium	High	High



- A number of companies are experimenting with various integration technologies. They are still quite tentative in their commitment.
- Most work is focused on the PC-to-PC level. They have found that linking together same-make PCs is relatively easy and that different-make PC networks are technically feasible from a CPU standpoint but require great discipline from software, peripheral, and data standpoints.
- The bottom line is that any widespread integration will be a medium- or long-term issue for most firms. The explosion in PC use will be taking place at a much faster rate.
- Most IS departments, consequently, can put off dealing with integration issues as a priority item. Instead, IS energies should be used to address the problem areas analyzed in the previous sections; i.e.:
 - Standardization.
 - Documentation.
 - Attaining value.



VI THE EMERGING IS ROLE



VI THE EMERGING IS ROLE

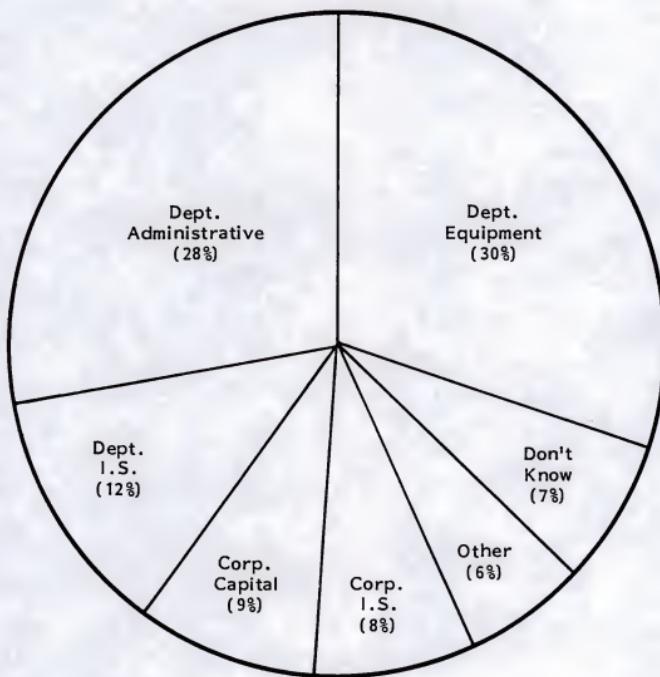
A. CURRENT INFORMATION SYSTEMS' RELATIONSHIP WITH PERSONAL COMPUTERS

- Currently, many IS departments are in an ambiguous position with regard to PCs in their organization.
 - Almost all PC funding is coming from nontraditional sources, as shown in Exhibit VI-1.
 - Corporate IS is funding a negligible 8% of PC expenditures.
 - Most funding is coming from general departmental funds (e.g., administrative or equipment budgets).
 - This means that it is very difficult for IS, or any other central location, to obtain an accurate picture of the size and velocity of spending for PCs.
 - It is no coincidence that current PC users have independent attitudes, by and large. Little more than one out of five PC users views the IS department as a source of assistance for themselves, as shown in Exhibit VI-2. They are, after all, the pioneers; however, it is also quite likely that they will set the tone for PC user attitudes for some time to come.



EXHIBIT VI-1

BUDGET SOURCES FOR PERSONAL COMPUTER FUNDS

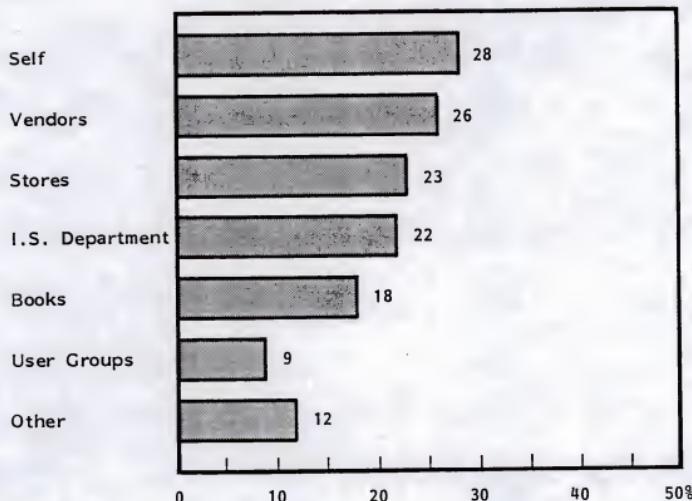


SOURCE: INPUT Survey



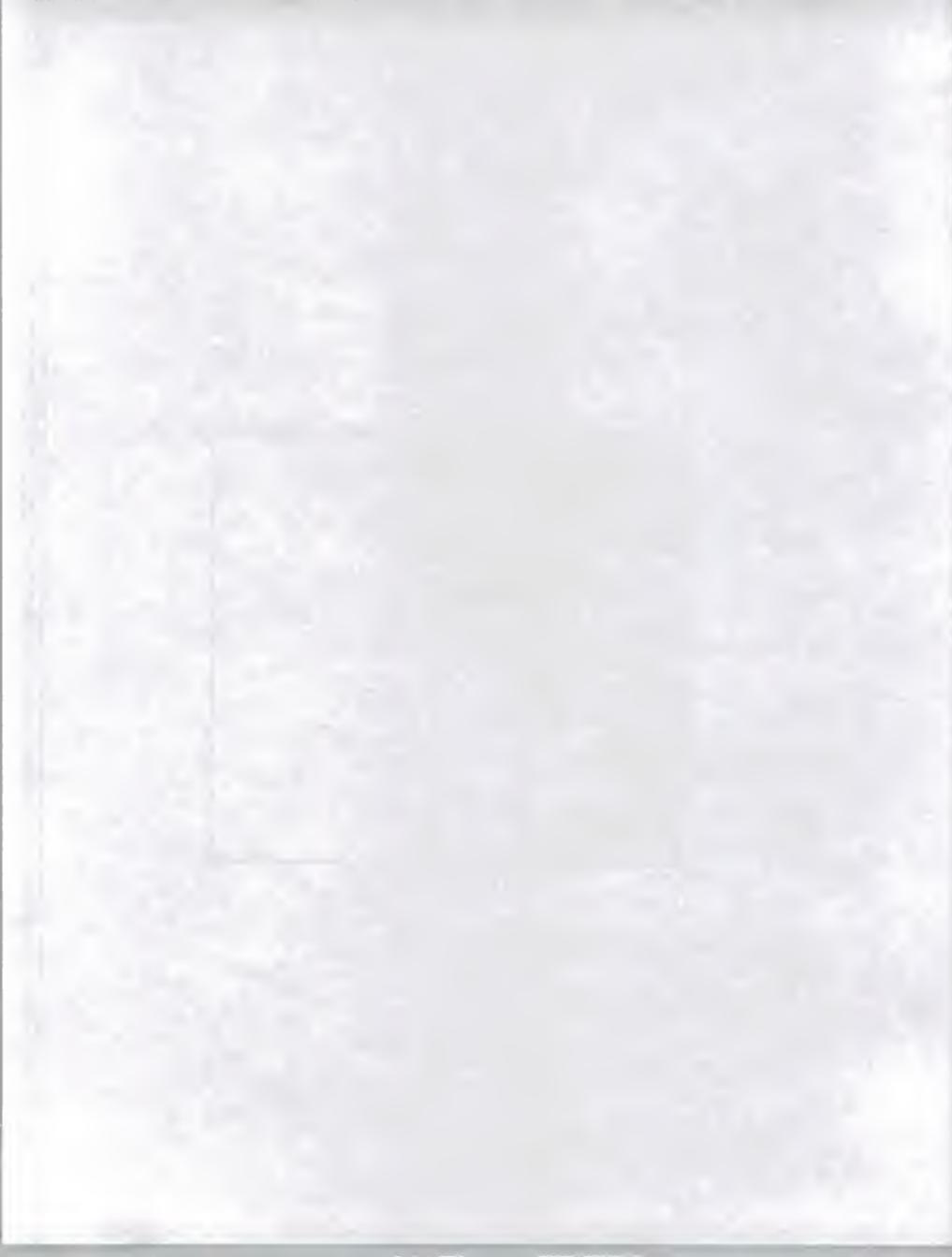
EXHIBIT VI-2

SOURCES OF ASSISTANCE FOR
PERSONAL COMPUTER USERS



Note: Total is more than 100% because of multiple sources.

SOURCE: INPUT Survey



- It is noteworthy that the most common source of assistance ("self") was not on the offered list of alternatives in INPUT's survey, but was volunteered by the PC users interviewed.
- This self-reliance is undoubtedly mostly a product of PC users' self-confidence. There are also other, less positive reasons for self-reliance: ignorance of other sources of assistance, bad experience with other sources, or lack of time to seek out other sources.
- The reasons for PC users relying (or not relying) on IS for assistance can be quite varied. Exhibit VI-3 summarizes the major reasons.
 - The current driving force for users' not relying on IS departments is lack of knowledge: users' ignorance of how IS can help and IS lack of knowledge of how it can help.
 - Many IS departments are in a peculiar position since, in some respects, the IS department is a functional competitor with the PC. This is especially true for organizations that have established extensive in-house timesharing networks to replace commercial timesharing or as the foundation for an Information Center.
 - This situation produces ambivalent IS attitudes toward the PC:
 - Should the Information Center concept be emphasized or de-emphasized?
 - Should PCs be helped or hindered (or ignored)?
 - Perhaps, in fact, PCs can somehow be integrated with an Information Center.



EXHIBIT VI-3

REASONS FOR PERSONAL COMPUTER USERS'
RELIANCE OR NONRELIANCE ON I.S.

RELIANCE ON I.S.	NONRELIANCE ON I.S.
<ul style="list-style-type: none">• I.S. Actively Markets its Services, Seeks Out PC Users• I.S. Has Knowledge of PCs• I.S. Provides Incentives to Use Its Services• PC Users Are Forced to Utilize I.S.• I.S. Assistance is Nonthreatening• PC Users Believe I.S. is Expert In All Computer Areas	<ul style="list-style-type: none">• I.S. Does Not Market Its Services• I.S. Does Not Wish to Become Involved with PCs• I.S. Has Little Knowledge of PCs• I.S. Seeks to Control PC Development• PC Users Are Unaware of I.S. Resources• I.S. is Too Procedural or Life Cycle Planning Oriented



- There is no doubt that there is a real issue here. Many PC users were first impelled to consider and then purchase a PC because of the high costs of commercial timesharing services. The motivation for this is well understood by most IS departments since similar motivations have brought timesharing in-house in many companies.
- However, PCs have other advantages:
 - PC applications can be brought up about as quickly as applications supplied by a commercial timesharing service but at much lower cost for tailored applications (via "templated" packages). Bringing up specialized applications on in-house timesharing systems can sometimes be a slow, expensive undertaking.
 - PC response time is often slow, but it is consistent. Users know how long a process will take and, if it is lengthy, can do something else in the meantime. In-house timesharing response time is often unpredictable; it is this lack of predictability, rather than the average response time, that concerns most users (see INPUT's report Evaluating the EDP Level of Service, June 1982).
 - Most PC users strongly believe that PCs are easy to use. This belief is held although, viewed objectively, much PC hardware and software are not in fact very user friendly; the original VisiCalc, for example, is quite crude compared to more sophisticated (and expensive) mainframe-base planning tools.
 - PC users apply a double standard: they accept PC inconveniences that they would complain of vociferously if supplied via a mainframe system.
 - The pride of ownership often, in the short run at least, blocks out such unpleasantness. Other PC users accept minor inconvenience as the price to be paid for total control.



- This double standard is one that IS management will have to learn to cope with.
- The fact that PCs can be under total user control is the strongest motivating force behind the growth of PCs. Users can do what they want, when they want to.
 - This often (but not always) requires more user time and involvement than dealing either with a vendor or the central IS department. The trade-off is that users come much closer to getting the systems that they believe they need.
- Apparent costs are also much lower, since there is little out-of-pocket money spent on vendors for development efforts, and analyst and programming functions are not broken out and counted separately, as in IS-controlled projects. The real costs may be appreciably higher than the apparent costs, but many departments would prefer that these be kept under wraps and not exposed to outside inspection.
- To summarize: these three computing alternatives, personal computers, commercial timesharing, and in-house timesharing, each look quite different from the end user's viewpoint. Depending on which characteristics are most important to the user, one may be more desirable than another.
- Exhibit VI-4 shows how well each characteristic is served by the different computing alternatives; the key factors discussed above are denoted by asterisks.
- For many users, PCs score higher than the other two alternatives. The difference is especially striking when comparing key PC factors to key in-house timesharing/Information Center factors.



EXHIBIT VI-4

CHARACTERISTICS OF COMPUTING ALTERNATIVES FROM THE
USER'S VIEWPOINT

CHARACTERISTIC	COMPUTING ALTERNATIVES		
	PERSONAL COMPUTER	COMMERCIAL TIMESHARING	IN-HOUSE TIMESHARING/ INFORMATION CENTER
Initial Entry Cost (For a Department)	Low	Very Low	Very Low
Operating Costs (For a Department)	Very Low	High*	Medium
Corporatewide Costs	Medium to High	High*	High*
Demands on User Personnel	Medium to High	Low to Medium	Medium
User Control	High*	Medium to High	Medium
Application Flexibility	Medium to High	Medium to High	Medium
Features Available	Medium to High	High	Medium
Response Time Consistency	High*	High*	Medium*
Application Tailoring			
Implementation Speed	High*	High*	Low /Medium
Cost	Low to Medium	High*	Medium to High
Ease of Use	Medium to High	High	Low to Medium*

* Key Factors Determining Acceptance



- Some organizations are attempting to hold back PCs while at the same time introducing or upgrading their Information Center-like end user facilities.
 - In a few cases this will be a viable strategy. In most cases, though, it will only leave the organization as a whole (and IS particularly) unprepared for the almost inevitable wave of PCs. (The relationship of PCs and the Information Center will be analyzed in INPUT's upcoming 1983 report, Organizing the Information Center.)
 - Consequently, even IS departments that are not fully convinced of the effectiveness or economics of PCs should lay out a strategy for maximizing the PC's positive contribution to the organization.

B. SHOULD INFORMATION SYSTEMS BECOME INVOLVED?

- IS staff can become, both formally and informally, involved in PC activities in a number of areas, including:
 - Hardware and software selection.
 - Procurement monitoring.
 - Dealer selection.
 - Data standardization.
 - User groups.
 - Information exchange.
 - User support.



- There are sound reasons for becoming involved in all of these areas; however, IS departments should not rush in without understanding the issues involved. This section lays out these issues.

1. HARDWARE AND SOFTWARE SELECTION

- Untutored users need help. Even trained selectors need help. Unfortunately, help is rather scarce now, reflecting the infancy and general disarray of the PC universe.
 - A few users may have their hearts or minds set on particular hardware or software. Most, though, will listen to and often follow expert opinion.
 - The selection process is especially important because many current hardware vendors and most software vendors will have faded from the scene long before their products are functionally obsolete. Consequently, being product selector is not a risk-free position.

2. PROCUREMENT MONITORING

- There are several reasons to monitor PC purchases:
 - To identify who is using what hardware and software. Users can be put in touch with others in the organization with similar applications, hardware, software, etc. It may also be possible to set up exchanges with people in other organizations with parallel interests.
 - To identify the use, or potential use, of hardware or software that is not on the recommended list and to learn the reason why nonstandard items are desired.



- To identify cost savings accruing from buying from vendors where special discounts have been arranged.
- To learn of expected and actual benefits resulting from PC hardware or software acquisition.
- To learn of expected and actual cost savings resulting from PC hardware or software acquisition.
- This last point is an important one. Buying PC add-ons, especially software, is like eating peanuts - you cannot stop eating, and before you know it the whole bowl is gone; e.g., one "Calc" program may only be \$200. However, if there are 500 PCs in an organization, then the cost is \$100,000 if everyone buys at list price.
 - Significant (i.e., 40% plus) discounts are available for multiple-copy buys.
 - It should be noted that in a large organization the aggregate cost of "Calc" programs can be close to the cost of one of the more expensive mainframe financial planning packages, which is still more powerful, more flexible, and easier to use.
 - However, mainframe-based alternatives will probably be more expensive to run and will not provide the response time and availability of PC-based programs.

3. DEALER SELECTION

- Dealer selection is a natural outgrowth of hardware and software selection. The virtues or defects of a particular dealer may very well influence product selection.



- While there is still much uncertainty over the final structure of PC hardware and software distribution, most hardware and software manufacturers increasingly rely on retail dealers to serve their buyers. It is another symptom of the youth of the PC business that many dealers are incompetent and/or untrustworthy; at least 10% will fail in the next year.
- Dealer selection will often logically fall to the IS department. However, many IS departments will not be used to dealing with the issues and personalities in this new environment.

4. DATA STANDARDIZATION

- Users will usually look positively on IS efforts to recommend hardware and software and to select a computer dealer.
- Some users, though, will look less kindly on IS efforts to standardize data definitions and data exchange protocols and procedures.
- Data definitions are important in order to make sure that "apples" are compared to "apples." Some users believe that uniform data definitions are not very important because:
 - Their data is just used for "back of the envelope" calculations.
 - The data does not leave their department.
 - They have always defined data a particular way.
 - It would be too much work to modify their data.
- Some of these objections may be valid. The problem is that users attempt to compare data which seem to be alike but are not.



- Sometimes an edited version of portions of the IS data dictionary can be used as an agreed-on standard. Often, however, departmental data are an awkward subset or superset of IS data which the department has been manually transforming for central system input for many years. Many departments will welcome the chance to rationalize their data; others will not.
- The issue becomes critical when data must be exchanged. Data exchanges can take many forms, as was shown in Exhibit V-4.
 - The manual forms of data exchange, accomplished by comparing or combining printed reports, are more difficult and insidious since the data differences (in format, meaning, or transformations) may not be apparent for a considerable time.
 - Diskette exchanges are difficult or impossible between different manufacturers' hardware. This is an important reason for limiting hardware varieties.
- For some operations-oriented departments, data exchange is the heart of their reason for being. Usually they will have a significant terminal load already.
 - It would make little sense to have a PC sitting next to what may already be a very intelligent terminal (although it has been done). This is especially true if the department wishes to manipulate the same data that it has been receiving or sending.
 - Most PCs have not addressed the integrated PC/terminal question comprehensively. Often the issue is ignored. In the DEC world the VT-100 can be upgraded to a full microprocessor by a field kit. However, it has taken a terminal manufacturer from the non-IBM world (Beehive International) to come up with a truly integrated terminal/PC compatible with IBM mainframes. (Beehive was discussed earlier in Chapter IV, Section C.)



5. USER GROUPS

- User groups are critical links in disseminating information on new products and applications, solutions to problems, and a pipeline into vendor plans. User groups can be:

- Geographical (e.g., Boston Computer Society).
- Vendor oriented.
- Computer store based.

Organized within a company.

- This last type of user group is particularly valuable if a company has enough interested people. IS people will often, but not always, take the lead in forming such a group.
- However, it should be a true user group to be effective. IS should contribute support and background; it should not set direction or policy. This may sometimes be uncomfortable if the user group asks for resources that IS is unwilling or unable to supply. IS should try to cope with all of the organized users' reasonable (and some of their unreasonable) requests.
- The alternative to an organized user group is a series of one-to-one relationships with individual user areas. This will create more work for IS, with usually less accomplished and lower user satisfaction.

6. INFORMATION EXCHANGE

- The internal user group is a good, low-cost means of collecting and disseminating internal information, users' experience, and vendor announcements, as



well as data collected from publications and other sources which are of actual or potential interest to a company; if the plethora of information that is available is not sifted through, the trees will obscure the forest. Defined areas of interest include:

- Hardware (vendors, devices, functions, and features).
- Industries (which are similar to the company's).
- Applications (particularly important for software).
- Special interest areas within the user group should be set up to focus knowledge and information. Examples include:
 - Hardware enhancements.
 - Communications.
 - Software packages - nonapplication.
 - Software packages - application (this may be further subdivided).
- Because of incompatibilities and different offerings, multivendor environments may need to have at least some of their user group activities similarly subdivided.

7. USER SUPPORT

- IS can provide support in two different ways:
 - It can provide support directly by furnishing full- or part-time staff to:



- Advise on the selection and use of vendor-supplied hardware and software.
- Design systems and then program them.
- Provide staff support to internal user groups.
- Negotiate with vendors.
- IS can also, or instead, make sure that support is provided by non-IS sources. This includes:
 - Developing expectations in users and user groups so that users will address and solve many of their own problems.
 - Establishing good relations with one or more local computer dealers so that the dealer will provide training, assistance, and maintenance.
 - Encouraging use of packaged solutions modified by users.
- A special kind of support is the establishment of a reserve of spares (especially printers and disks) that can be internally shared so that downtime is minimized.

C. LEVELS OF IS INVOLVEMENT

- The previous section discussed what can be undertaken by IS. This section describes the different approaches that can be taken to achieve those goals.



- The IS department can become involved in personal computing on one of several levels, corresponding to the amount of control which IS exerts or seeks to exert. These five levels, from the most to the least control, place IS in the position of:
 - Controller.
 - Specifier.
 - Coordinator.
 - Information provider.
 - Informal advisor.
- Exhibit VI-5 briefly defines each level. At each level of involvement there is a different intensity of IS activity:
 - As controller, IS makes PC hardware and software part of overall IS system planning. PC data standardization functions are integrated with those of IS data management. User groups tend to be weak or nonexistent.
 - At the specifier level IS does not directly control but establishes the ground rules under which PC exists. A short list of approved vendors is drawn up; users are required to use the vendor(s) with whom IS has negotiated requirement contracts. IS promulgates comprehensive data definition standards and data interchange standards.
 - As coordinator, IS performs many of the same activities; however, these are guidelines rather than requirements. IS attempts to lead by persuasion and incentives, which can be quite powerful when correctly executed.



EXHIBIT VI-5

LEVELS OF PERSONAL COMPUTER INVOLVEMENT

CATEGORY	TYPE OF INVOLVEMENT
Controller	I.S. seeks to plan and control PC use as if PCs were extensions of the central I.S. department. <u>Comment:</u> Usually not feasible, although some I.S. departments would like it to be.
Specifier	I.S. seeks to define what departments can and cannot do with PCs and how the departments should proceed. <u>Comment:</u> Attempted in some companies/industries. Difficult to maintain in face of extreme PC dynamism.
Coordinator	I.S. seeks to guide, not dictate, PC direction. Sometimes viewed as second best to specifier or controller. <u>Comment:</u> An unfamiliar role for many I.S. departments.
Information Provider	I.S. makes a conscious effort to become involved in PC area but not to direct. <u>Comment:</u> May be the only feasible path where the company is very decentralized or I.S. is fighting fires on many fronts. Value of this approach should not be discounted: knowledge is power.
Informal Advisor	I.S. or individual I.S. staff members assist departments and people as requested. Knowledge base and, consequently, assistance are spotty. <u>Comments:</u> May be sufficient in a small, backward organization.



- IS as information provider typically gives advice when it is requested. IS does not usually attempt to establish data standardization or take a leading role in product and vendor selection.
- Where IS is informal advisor there is little institutional involvement; advice and recommendations are generally on a personal basis.
- Exhibit VI-6 summarizes the effects of each level of involvement in PC activities. Two observations can be made:
 - IS departments that are addressing different PC activities at different levels of involvement are usually not being consistent in relations with their users and will often waste a good portion of the IS effort.
 - . It is important for IS departments to decide which level of involvement is appropriate for them and to become involved in all activities on that level. (Slight variations in levels of involvement from one activity to the next are usually not serious.)
 - Generally speaking, the extreme levels of involvement have more negative than positive effects.
 - . Seeking to control or even to specify requirements is counter-productive. Much of the value of PCs comes from their flexibility and ability to meet the many and varied needs of users. The benefits of integration and efficiency, even when real, are not nearly as great.
 - . The other extreme of adopting a very low profile can have equal, but opposite, faults. User efforts and enthusiasm are undirected and confused, duplication and incompatibility are widespread, and disappointment is rarely far behind.



EXHIBIT VI-6

LEVELS OF I.S. INVOLVEMENT IN PERSONAL COMPUTER ACTIVITIES

LEVEL OF I.S. INVOLVEMENT	PC ACTIVITIES					
	HARDWARE/ SOFTWARE	DEALER SELECTION	DATA DEFINITIONS	DATA EXCHANGE	USER GROUPS	SUPPORT
Controller	Part of I.S. System Planning	Chosen by I.S.	Functions Inte- grated with I.S. Data Management	Functions Inte- grated with I.S. Data Management	Weak or Nonexistent	Part of I.S. Training Responsibilities
Specifier	I.S. Draws Up "Short List" (Requirements)	I.S. Negotiates - Requires Use	Comprehensive I.S. Data Definitions	Standards	I.S. Dominates	Comprehensive Planning
Coordinator	I.S. Draws Up "Short List" (Recommendations)	I.S. Negotiates - Gives Incentives to Use	Limited I.S. Data Definition	Guidelines	Leading Role by I.S. Management	Comprehensive Planning
Information Provider	Regular I.S. Advice	Regular I.S. Advice	Few Data Definitions	Ad Hoc Recommendations	Active Role by I.S. Staff	Fills in Gaps
Informal Advisor	Ad Hoc Recommendations, Usually Personal	Sporadic Advice	No Involvement	Ad Hoc Recommendations, Usually Personal	Passive Role by I.S. Staff	Unplanned, Person-to- Person



Exhibit VI-7 summarizes these positive and negative effects.

- Thus, for many organizations, the coordinator role will be the most effective IS approach to PCs.

D. SELECTING THE IS ROLES

- While the coordinator role will usually be the most effective, each IS organization should select the level of involvement that best fits its overall corporate environment. Factors to consider include:
 - How control-oriented the organization is.
 - The confidence which users have in IS.
 - The receptivity toward and importance of PCs in the organization.
 - Past organizational experience with PCs. For example, if PCs have been introduced in an uncontrolled manner that is perceived as being successful, then IS should wait for the situation to develop. Timing is obviously very important, since if the initiative by IS is too late, the task will be much more difficult.
- There is, then, a definite need for IS to take an active role in PC development. The IS position is not easy:
 - It will have to be the motivating force in bringing about greater control over PC efforts.



EXHIBIT VI-7

POSITIVE AND NEGATIVE EFFECTS OF
DIFFERENT LEVELS OF I.S. INVOLVEMENT IN
PERSONAL COMPUTER ACTIVITIES

LEVEL OF IS INVOLVEMENT	POSITIVE EFFECTS	NEGATIVE EFFECTS
Controller	<ul style="list-style-type: none"> • Least Duplication of Effort • Most Integration With I.S. Systems 	<ul style="list-style-type: none"> • Length Lead Times • Discourages Innovation • PCs as Expensive Terminals • Users Avoid I.S.
Specifier	<ul style="list-style-type: none"> • Little Duplication of Effort • Low Risk of Hardware, Software Incompatibilities 	<ul style="list-style-type: none"> • Experimentation Constrained • Considerable I.S. Time Required • Frozen in Obsolescent Approaches, Technologies
Coordinator	<ul style="list-style-type: none"> • Wide Experimentation Possible • Users Enthusiastic 	<ul style="list-style-type: none"> • Considerable I.S. Time Required • I.S. Role Changing, Ill-defined • Some Risk of Duplication and Incompatibilities
Information Provider	<ul style="list-style-type: none"> • Very Wide Experimentation Possible • Users Enthusiastic 	<ul style="list-style-type: none"> • Hardware and Software Incompatibilities • Higher Risk of Duplication of Effort
Informal Advisor	<ul style="list-style-type: none"> • Very Wide Experimentation Possible • Fewer I.S. Resources Needed (In Short Run) • Some Users Enthusiastic 	<ul style="list-style-type: none"> • Extensive Hardware and Software Incompatibilities • Widespread Duplication of Effort • Risks of Widespread PC Disappointment



- The reasons for IS doing so are to guard against future, not current, problems. By the time the problems are apparent to all it may be too late to take effective action; at the least, far more effort will be needed to achieve much less.
- At best, IS efforts may be viewed like ants at a picnic, a minor drawback to what is otherwise a good time. At worst, IS steps can confirm the views of many users, who see IS as being extremely "dictatorial" or "slow" in their approach to PCs (actual quotes from focus groups).
- Because of the ambivalent attitudes toward IS which exist in some organizations as well as difficulty in breaking new ground, IS should carefully plan its steps in approaching PCs. If done correctly, IS's PC planning and support efforts can go far to building bridges to its users. The next chapter provides an analysis and recommendations for the actions that IS should take.



VII RECOMMENDED IS INITIATIVES



VII RECOMMENDED IS INITIATIVES

A. THE COORDINATOR OF PERSONAL COMPUTER ACTIVITIES

- Based on the analysis of the preceding chapter, INPUT recommends that most IS departments would be best served by adopting the "coordinator" approach to dealing with PC issues.
- The key role in the coordinator model is the person who will be coordinator. The position will not usually be a full-time responsibility except in very large organizations and, often, in any size organization while the function is being organized. The characteristics of someone suited for this position include:
 - A general knowledge of PCs and enthusiasm for them.
 - A low-keyed personality.
 - Ability to deal with people.
 - Flexibility and tact.
- The chief responsibilities of IS and the PC coordinator cover the following areas:
 - Vendor selection and negotiation: Section B.



- User groups: Section C.
- Information exchange and communications (newsletter, PC library): Section D.
- Direct involvement of IS with Personal Computers: Section E.
- Standards and guidelines: Section F.
- Documentation: Section G.
- Monitoring: Section H.
- Each of these areas will be discussed in the remaining sections of this chapter, and recommendations will be made for particular actions to be adopted.
- Exhibit VII-1 shows in pictorial form the various relationships between the PC coordinator and other groups and functions.

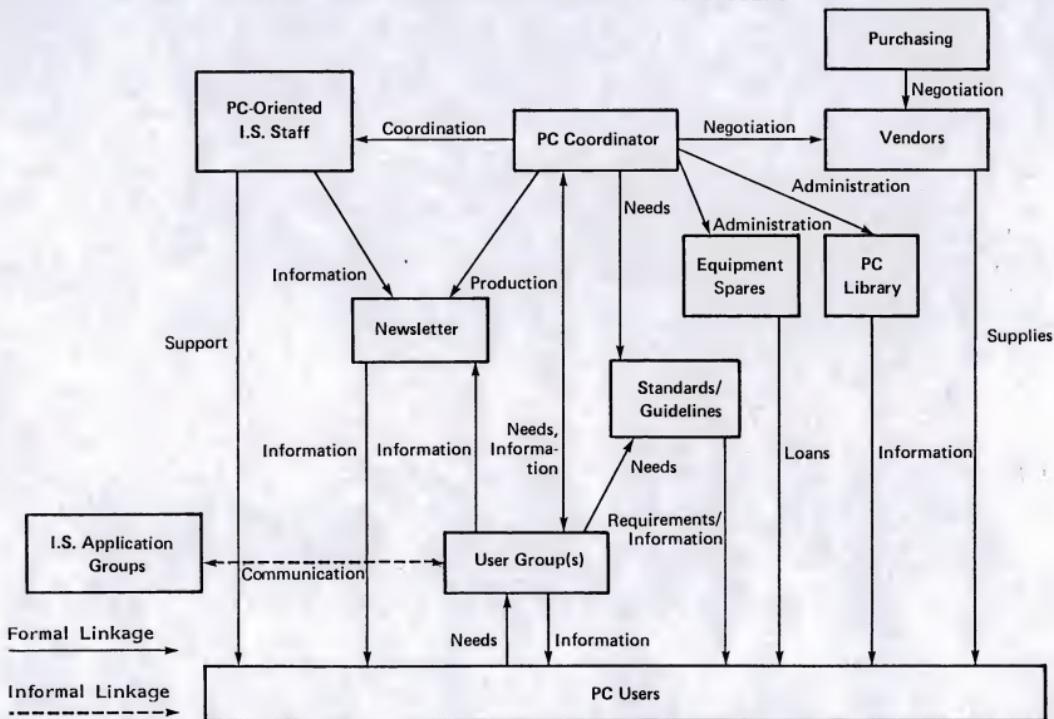
B. VENDOR SELECTION

- PC hardware is rapidly on its way to becoming a commodity. It is unlikely that a new, obscure vendor will be able to offer a compellingly unique product, at least for very long. Consequently, it will probably pay to be conservative:
 - IBM PC plug-compatible hardware may offer marginal price-performance advantages, but the IBM PC is good equipment and IBM does provide volume discounts.



EXHIBIT VII-1

THE PERSONAL COMPUTER COORDINATOR AND USERS





- Firms like Xerox, DEC, and Wang will always be around in some form. Even if some of them do not survive in the PC marketplace, they will still support their equipment.
- Firms like Apple, Osborne, and Tandy may not always exist as corporate entities; however, their installed base is large enough (or, in Osborne's case, will soon be) so that someone would take over their product lines.
- It is desirable to standardize on as few hardware vendors as possible (optimally, one).
 - This will provide an organization with more clout in arranging discounts.
 - It will make vendor after-sales support more attentive and efficient.
 - Multivendor hardware maintenance is at least as difficult for PCs now as it was in the early days of the IBM plug-compatibles. This is accentuated by the policies of many vendors who do not repair foreign attachments. (In some cases, they do not even repair their own equipment as long as other vendor add-ons or peripherals are hooked up to it.)
- Hardware is simplicity itself compared to software. With the exception of a few "household words," PC software is a sea of undifferentiated packages and vendors, most with more faults than virtues. Order will not be introduced into the marketplace for several years.
 - Support is not the same issue as it is with PC hardware (or with mainframe software): typically, there is none.



- Therefore, it is important to decide what, if any, special requirements an organization has for spreadsheet packages, word processors, etc., and then test several. Computer stores will not do this for the average customer, but they will for a large account.
- Afterwards, an organization should try to standardize on a particular package in each category. This is important for discounts, support, and semicustomizing.
- If at all possible, all of a firm's business should be channelled through a single computer store. The caliber of a particular store may well influence which hardware is vendor-selected, especially outside of major metropolitan areas. Most stores, when faced with the potential for large, continuing orders, will give attractive discounts.
 - Dollar volume discounts should apply to both hardware and software.
 - It is not desirable to press too hard for discounts, especially on independent stores: many will have a difficult time in the coming year (10-20% may fail), and a store may offer discounts too large for it to properly provide support.
 - A rule of thumb: it is too large a discount if it is as great as that given by mail order firms.
 - Discount moderation is important because a good computer outlet will provide training, knowledgeable product advice, and hardware maintenance.
 - References should be obtained and checked, especially with local computer groups, on the reputation of computer stores.



- Where necessary, a limited amount of on-site service should be built into the agreement with the computer store.
- There will be much less flexibility in building in maintenance when a PC manufacturer relies on a third-party maintenance firm. Two of the main firms, TRW & Sorbus, for example, have quite different maintenance philosophies: TRW is leaning more to on-site maintenance, and Sorbus to carry-in maintenance.
- The IS organization will be a good technical interface when negotiating with vendors or dealers. However, many IS organizations do not have extensive experience in negotiating price and terms and conditions. Much of IS main-frame-related business (especially with IBM) is on an essentially take-it-or-leave-it basis.
 - There are few standard practices in the PC marketplace. For the next year at least, many vendors will feel the allure of making potentially large deals with major corporate buyers.
- INPUT recommends that IS departments work closely with the Corporate Purchasing Department, both in actual negotiations and in structuring an advantageous agreement.

C. USER GROUPS

- Where user groups do not already exist, IS should assist in setting up one or more of them. Where an organization has users who are active in diverse areas, specialized user groups should be encouraged.
- User groups should be viewed and treated as autonomous entities and not as adjuncts to the IS organization. Otherwise, they will become too bureaucratic



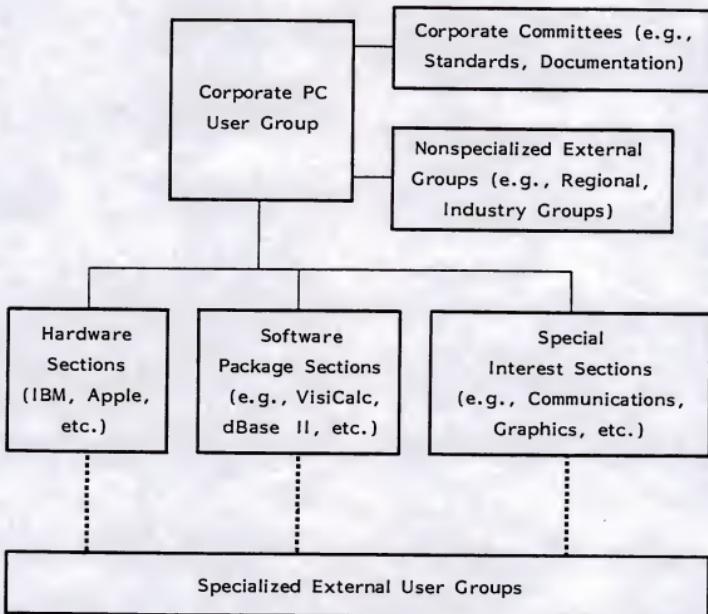
and will not always be good upward channels of communication. IS should, however, provide logistical support; i.e.:

- A meeting area.
- Internal publication production.
- A PC library (see Section D of this chapter, "Information Exchange and Communications").
- Access to the IS PC configuration (see Section E of this chapter, "Direct Involvement of IS with Personal Computers").
- The main user group can be the focal point for many other groups, both internal and external, as shown in Exhibit VII-2.
 - Of particular interest to IS is the main user group in the construction and application of corporate PC standards and guidelines.
 - User group input will tend to make the resulting products more functional and reality oriented.
 - Equally important, the user group activists are those who will react the most strongly to standards. As part of the standards development process, they should become supporters rather than opposers. User group members can be very important "marketers" of corporate standards (assuming that the standards' benefits outweigh their burdens - see Section E of this chapter).
- The PC coordinator should be an ex officio member of all corporate user groups, although probably only taking an active personal role in the main user group.



EXHIBIT VII-2

USER GROUP LINKAGES





- User groups and their analogs in IS functional and application groups should be encouraged to work together informally. This will often occur naturally when IS staff with an interest in PCs belong to the PC user group.

D. INFORMATION EXCHANGE AND COMMUNICATIONS

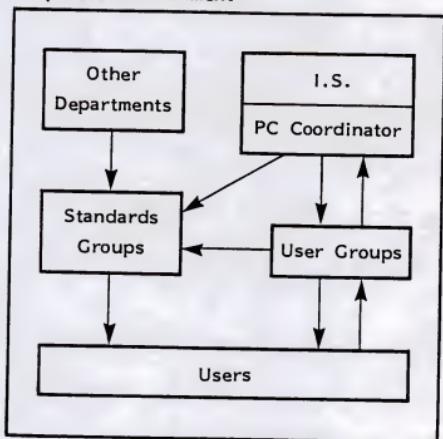
- Good internal communications are essential to the successful use of PCs. However, PC information flows are complex; Exhibit VII-3 is a simplified version of the major communications flows.
 - Because of the evolving state of the PC environment, external information (from vendors, publications, and user groups) is very important as well.
 - The problem with dealing with this veritable flood of outside information is to avoid missing important developments while not having large numbers of PC users duplicating their efforts.
 - The PC coordinator can help in bringing order to dealing with external information by setting up institutional methods for collecting and disseminating external information.
- The IS department via the PC coordinator should sponsor a PC newsletter and a PC library.
 - The newsletter would report on items of general interest to the corporate PC community. It should not be viewed as a replacement for commercially published PC publications. The internal newsletter would include:
 - Summaries of all internal user group meetings.



EXHIBIT VII-3

COMMUNICATIONS FLOWS

Corporate Environment



External Environment

- Hardware Vendors
- Software Vendors
- Dealers
- User Groups
- Publications



- Time and place of future user group meetings (both internal and external).
- Recent hardware and software acquisitions.
- Recent PC applications implemented.
- Proposed and implemented corporation standards, guidelines, and procedures affecting PC users.
- Success stories and other items of human interest.

- The PC library would be a common resource point for all PC users. It would probably be located in IS space. Organizations with dispersed facilities would want sublibraries with most of the same holdings. The library should be set up so that no more than a few hours per week of staff time would be required to maintain it. The library should include:

- Copies of PC publications.
- Extra copies of PC hardware and software manuals for major hardware and software items.
- Lists of all corporate users by hardware, software, and applications.
- Vendor literature.
- Corporate standards and procedures affecting PCs.
- Clippings filed by major interest areas (for organizations with specialized user groups, these would be collected and, perhaps,



physically maintained at a separate location, by the specialized user group).

- Information from major vendors and external user groups would be channelled through the appropriate corporate user group.
 - Items of special interest would be passed on to the main user group and appear in the newsletter.
 - Volunteers would clip items in the course of their regular reading for specialized user groups and/or the PC library.
- Publication can be quite useful. Publications like Datapro provide descriptions for a reasonably comprehensive set of products. However, they make few value judgments or comparisons between products.
- Almost overnight a large industry has grown up to cater to the personal computer world. Although they were originally for hobbyists, most of these publications now have some orientation to the business user. At the least, these magazines are fascinating reading. Exhibit VII-4 lists the major publications.
 - Several of these should be read regularly by IS staff involved in personal computing. The choice can be one of personal taste since major developments are covered by most magazines.
 - The chosen magazines should be subscribed to and clipped for articles of interest.
 - One of the major values of these publications is their reviews of hardware and software products. These reviews are definitely judgmental, if not opinionated, and can be very helpful in determining the most valuable PC features and performance for a particular environment.



EXHIBIT VII-4

REPRESENTATIVE GENERAL INTEREST
PERSONAL COMPUTER PUBLICATIONS

- Byte: new technologies and applications.
- Creative Computing: covers full range from games to business applications.
- InfoWorld: weekly; extensive hardware and software reviews.
- Interface Age: Z80, 8080, S-100, orientation.
- Microcomputing: still largely hobbyist in orientation.
- Mini-Micro World: oriented to large corporations.
- Personal Computing: covers full range from games to business applications.
- Small Business Computers: bimonthly.



- The Apple, TRS-80, IBM PC, and VisiCalc all have at least one publication devoted solely to this one product, its add-ons, and associated products. When such products are installed, these magazines should definitely be read.
- A particular form of information collection is a periodic corporate survey of hardware, software, and applications. The survey should be relatively simple in order to encourage its completion. Sample survey forms are shown in Exhibits VII-5 through VII-7.
 - The first page of the survey tracks hardware, software, and other acquisitions (and de-acquisitions, especially in the case of hardware).
 - The second page focuses on tailored software.
 - The third page is an applications summary.
- Given the volatility of recent PC activity, quarterly surveys would be necessary for many organizations. Surveys should be made, at the least, every six months.

E. DIRECT INVOLVEMENT OF IS WITH PERSONAL COMPUTERS

- IS will be directly involved with PCs in three ways:
 - By providing support to other PC users.
 - As a PC user itself.
 - By stocking common spares.



EXHIBIT VII-5

PERSONAL COMPUTER SURVEY - PAGE 1,
ACQUISITIONS

CHECK ONE:

- Complete inventory
- Contains only changes since survey dated:

Date:

Department Name, Location, ID Number:

* Check one: H = Hardware; S = Software; O = Other



EXHIBIT VII-6
PERSONAL COMPUTER SURVEY - PAGE 2,
PROGRAMMING/PACKAGE MODIFICATION

Date:

CHECK ONE:

- Complete inventory
- Contains only changes since survey dated:

Department Name, Location, ID Number:

* Check one: Prog. = New Programming; Mod. = Package Modification



EXHIBIT VII-7

PERSONAL COMPUTER SURVEY - PAGE 3,
APPLICATIONS

CHECK ONE:

- Complete inventory
- Contains only changes since survey dated:

Date:

Department Name, Location, ID Number:

* Indicate date of original date of implementation and most recent major modification (if any)



I. IS PROVISION OF PERSONAL COMPUTER SUPPORT

- IS staff with PC knowledge and/or desire can be used as a rotating PC support staff, up to perhaps one-half day per week. Support would include:
 - Product installation assistance.
 - Software package customization and semicustomization.
 - Troubleshooting.
 - Requirements analysis.
 - Newsletter writing.
- IS is the logical repository for this function and, by taking it on, IS will gain significant informal knowledge and influence on PC activities.
 - There will, of course, be a price paid in staff time that cannot be used on other activities (and/or additional IS staff for this function).
- It is usually more desirable to have numerous part-time IS staff supporting PCs rather than a few full-time staff.
 - There is better coverage and backup.
 - More IS staff can be exposed to PCs.
 - IS functional or application specialists can extend their specialties to PCs.



2. IS AS PERSONAL COMPUTER USER

- This can be a sensitive subject in some IS departments, where PCs are seen as interlopers to be controlled.
- However, IS, like all departments, has many small internal housekeeping and administrative activities that might benefit from using PCs.
- If IS is to be taken seriously in a PC world, it would be best to actually use PCs in at least a few areas.
 - Obviously, though, much IS PC usage will be in the support role of benchmarking, testing, etc.

3. STOCKING PERSONAL COMPUTER SPARES

- A special, optional duty of the PC coordinator is to maintain a supply of equipment spares to serve as a "loaner" pool for user equipment that is out of service. In organizations that have limited their equipment options, only a moderate-sized inventory need be maintained, focusing on the electromechanical equipment most prone to failure. Some companies, though, may find this function too much of an administrative burden and may also have problems in agreeing on the source of funds if money is tight.
- The main benefit of such a pool is that it permits the overall organization, acting through IS, to provide a carrot as incentive for users to acquire only approved equipment since only approved equipment will be stocked.
- IS can, of course, use these spares in its own PC activities and for PC research (e.g., networks, multi-user PC environments, etc.).



F. ESTABLISHING AND MONITORING STANDARDS AND GUIDELINES

- Standards specify the allowable boundaries for an activity. In the case of PC activities, standards would cover such things as:
 - What hardware and software items can be purchased.
 - How purchases should be made.
 - What PC applications should be documented.
 - How extensive particular PC documentation should be.
 - Which data elements can be exchanged between departments.
- Guidelines can be of two kinds:
 - Weak (i.e., voluntary) standards.
 - Suggested methodologies for achieving standards; e.g.:
 - How to identify PC hardware and software needs.
 - How to prepare documentation most effectively.
 - How to define data elements.
- INPUT recommends that standards be strong, but arrived at collectively and not specified by any single entity (e.g., IS).
- Standards and guidelines must be initially established (with subsequent modification) and then monitored (and enforced).

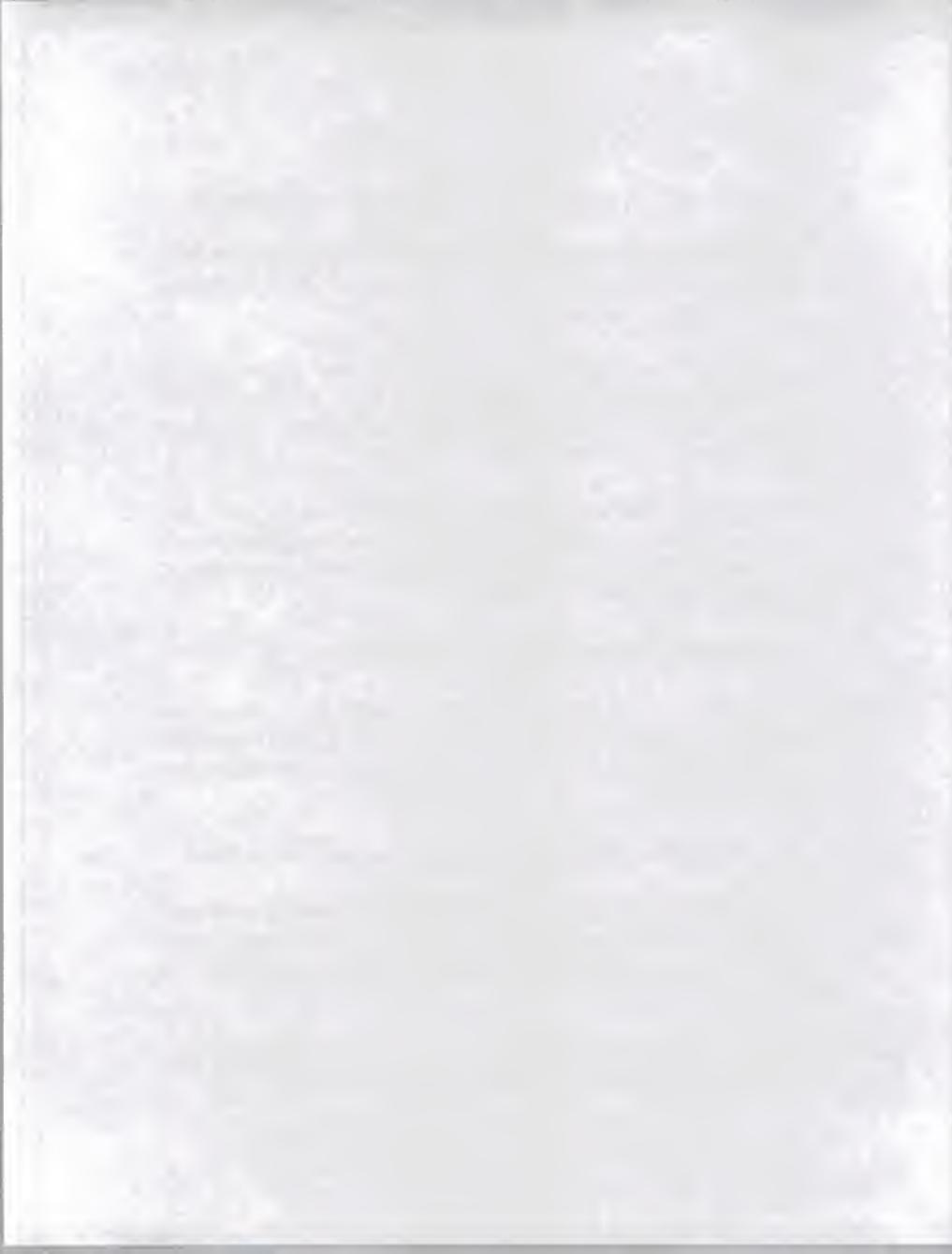


1. GENERAL PROCESS OF ESTABLISHING STANDARDS AND GUIDELINES

- A PC standards committee should be established with representatives from IS, the PC users group, major departments, and Internal Audit (with special attention to data processing auditors).
- It should be explicitly understood by the committee that PC standards can in many areas be far less detailed or restrictive than regular EDP standards. For example, the highly structured systems life cycle process used by many firms would not be useful in most PC settings.
- The standards setting exercise should be as much an educational tool to convince PC users of the need for standards as it is a methodology for establishing rules. Ideally, standards setting would be a bottom-up process, with PC users jointly setting their own standards.

2. HARDWARE AND SOFTWARE PACKAGE RESTRICTIONS

- Because of the advantages of working with a common set of hardware and software, the standards group should specify a "short list" of acceptable equipment and software packages. Similarly, the list of approved dealers should be restricted.
- The guidelines for achieving this were described in Section B of this chapter.
- The illegal copying of software is a special problem in the PC community. This abuse is, unfortunately, quite common in some PC circles; many rationalize the practice by saying that a PC software package should not cost more than \$25.
- Corporations must be on special guard that this perverse expression of individualism does not take root within the corporate PC community.



- PC software companies are becoming more aggressive in pursuing illegal copyists. The games software market, being the biggest and most abused, has seen several vendor-to-vendor legal actions for copyright infringements. Informally, the trade estimates that a quarter or more of the "Calcs" being used are illegal copies.
- Corporate users are especially at risk since they have more to lose than the average teenage copyist, and there is no Robin Hood aura about corporate activities to discourage prosecution. In addition, questionable corporate activities risk being reported by idealists, disgruntled employees, etc.
- Each company should have a formal, written policy statement that is circulated to all PC users that forcefully states the company's opposition to illegal copying of PC software.

G. DOCUMENTATION

I. ASSESSING DOCUMENTATION NEED

- The same level of documentation is not required for all PC applications. Some applications require no documentation, other applications require as much documentation as a production mainframe system. Exhibit VII-8 outlines four different levels of documentation and shows how their contents vary.
- How should the level of documentation be determined? This will depend on:
 - The amount of development resources needed.



EXHIBIT VII-8

DOCUMENTATION LEVELS

DOCUMENTATION LEVEL	CONTENTS
None	None
Minimal	<ul style="list-style-type: none">• Names of Application Developers• Brief Narrative of Purpose• Inclusive Dates of Use• "Program" Listing
Standard	<ul style="list-style-type: none">• All Above• Output Samples• Principal Corporate Documents Incorporating Computer Output
Complete	<ul style="list-style-type: none">• All Above• Data Sources/Definitions• Formula/Logic Assumptions and Rationale• Computer Output Distribution• Program Change History• Communication Protocols, Hardware, Software



- The "intensity" of the application (i.e., how long it will be used and the volatility of subsequent changes).
 - The application's importance for the department and the corporation.
- Exhibit VII-9 suggests how to calculate a numeric value for each of these application characteristics.
 - Development resources are scored by counting (or estimating) corporate staff man-weeks and out-of-pocket dollar expenditures. Note: the low ceilings are compared to conventional IS projects.
 - Application intensity is made up of the period of time an application is expected to be used and the number and complexity of expected changes.
 - The application can be important to a department and/or the organization as a whole.
 - Finally, an application can stand alone (as most do now) or it can have some type of connection with other systems.
- The analysis does not need to be lengthy or detailed to arrive at these values. In most cases it will be obvious how an application scores. Where there are doubts, the higher value should be applied.
- Exhibit VII-10 is a guide for translating scoring totals to a documentation level. These values (as well as those in Exhibit VII-9) can be adjusted to meet the needs of a particular organization.



EXHIBIT VII-9

APPLICATION CHARACTERISTICS QUANTIFIED

DEVELOPMENT RESOURCES			
Man-Weeks	Score	Expenditures (\$ thousands)	Score
0 - 0.2	0	\$0 - \$0.3	0
0.3 - 1.0	3	\$0.4 - \$1.5	3
1.1 - 2.0	10	\$1.6 - \$5.0	10
2.1 +	25	\$5.0 +	25
APPLICATION INTENSITY			
Length of Use	Score	Volatility	Score
1 Time	0	No Changes	0
1 Month or Less	3	Few, Trivial Changes	3
2 - 12 Months	10	Few, Complex Changes	10
13 Months +	25	Many Changes	25
APPLICATION IMPORTANCE			
Importance To Department	Score	Importance To Corporation	Score
None	0	None	0
Low	0	Low	3
Medium	3	Medium	10
High	10	High	25
APPLICATION ISOLATION			
Extent of Interactivity		Score	
Standalone		0	
Diskette Transfer		3	
On-line to Other PCs		10	
File Loading/Unloading with Mainframe		10	
DDP with Mainframe		25	

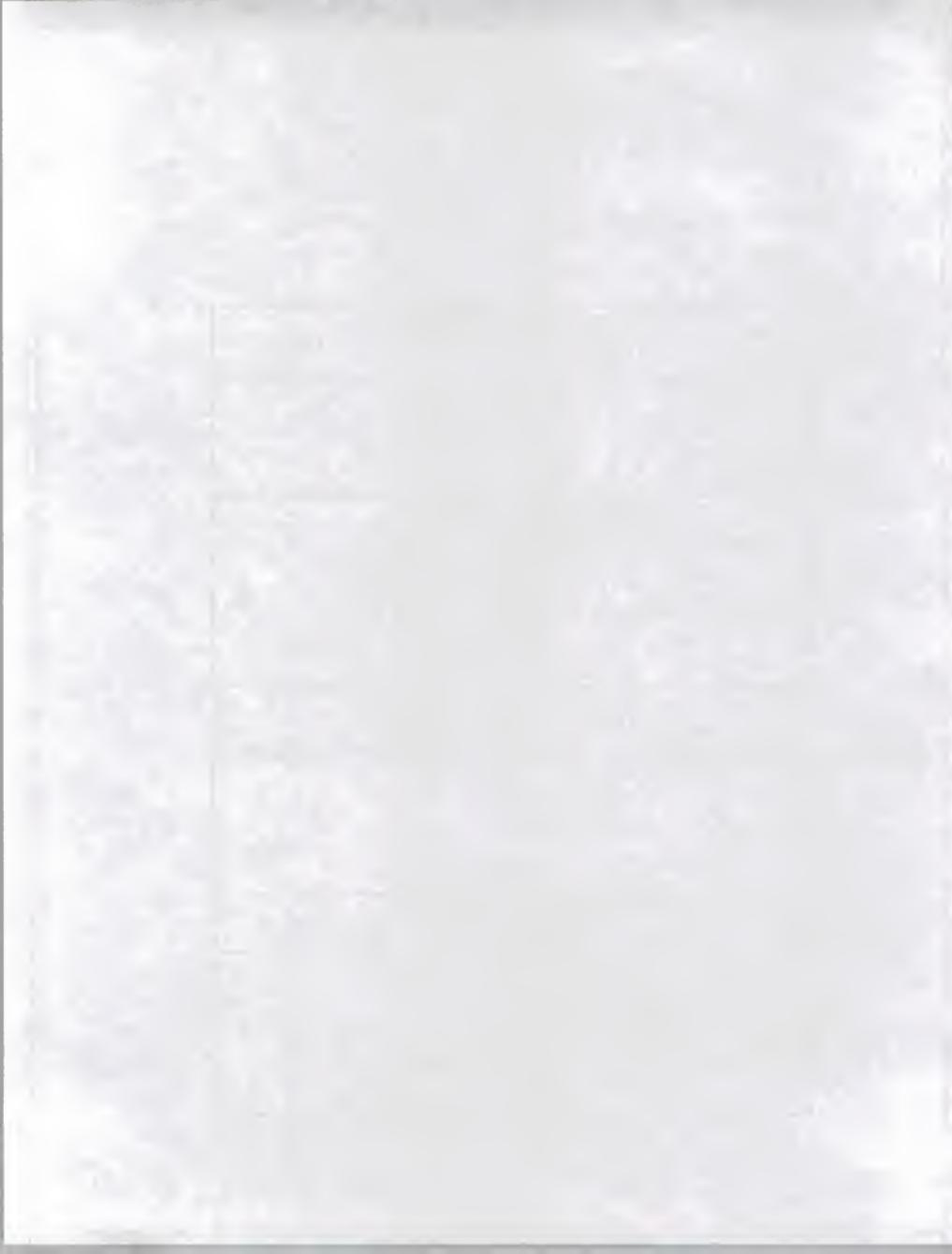


EXHIBIT VII-10

QUANTIFYING REQUIRED DOCUMENTATION LEVELS

TOTAL SCORE	DOCUMENTATION LEVEL
0 - 3	None
4 - 9	Minimal
10 - 30	Standard
31 +	Complete



2. DATA STANDARDS

- Current official IS data definitions can be used as, at the least, a point of departure for specifying data standards for PC use. To the extent possible, data definitions of PC users should be subsets or supersets of these IS standards.
- Great care must be taken to ensure that different departments are using the same data definitions. The same kind of analysis and missionary work that was required to install a DBMS will be required here.
- Interdepartmental PC networks will not be feasible unless most data are standardized in meaning and format.

3. ASSESSING VALUE

- For companies that have installed the discipline of financial tests for investments, some version of these tests should be applied to investments in PC activities.
 - It is not critical whether the test is ROI, payback period, discounted cash flow, etc., so long as it is commonly understood and accepted within the organization.
 - PC investments should be understood to be a combination of internal staff time and dollars.
- Companies, or parts of companies, that do not normally subject themselves to this kind of discipline should still establish some kind of cost-benefit standards, even if crude.
 - The minimum objective is to make sure that people think through why they are starting an activity. The proverbial back of the envelope is much better than nothing.



- These may well be guidelines rather than standards.

H. MONITORING ADHERENCE TO STANDARDS

I. THE PROCESS

- The IS department should become as little involved as possible in the "punitive" aspects of PC monitoring, e.g., enforcing purchasing, approving product and payback standards, or making guidelines. These duties should be avoided because:
 - IS usually lacks experience in this kind of enforcement.
 - New administrative processes would have to be set up.
 - Being a policeman will interfere with the more important role of counselor.
- The purchasing and accounts payable departments should assume primary responsibility for seeing that purchasing requirements are followed.
 - Organizations with strict rules on buying only specified products and/or using only specified sources would have the purchasing department adhere to these requirements when making or approving purchases.
- Similarly, the formal responsibility for monitoring the financial and efficiency benefits from PC acquisitions should be delegated to the internal audit group within the corporation. Internal Audit can conduct periodic studies to ascertain benefits.



- It would be important that Internal Audit have unquestioned authority to spot-check the backup materials behind any claims for benefits and cost savings.
- Just the knowledge that this might occur will make PC users far more realistic in their own assessment of benefits.
- This is not to say that the PC coordinator and the main user groups cannot (or should not) apply considerable informal pressure to see that agreed-on standards are followed. This is especially true for new users who may in innocence or ignorance select nonstandard hardware or software.
 - It is, after all, to their benefit to be able to draw on in-house experience with certain types of hardware and software. Sometimes another department will already have specially tailored PC software and hardware for a particular application that the new user needs.
 - New users (and old users) will be far more easily convinced about the good sense behind a rule if it is explained to them by a fellow PC user than if they read it in a procedures manual or are informed by IS.

2. MONITORING PURCHASES

- Somewhat controversial, but necessary, is the use of review and information processes in the acquisition decision.
 - In companies that have established relatively restricted acquisition rules, the purchasing department will have to review purchase or payment requests for accord with corporate policy.
 - In companies with less restrictive purchasing review, it would be appropriate that the purchasing department require a form similar to that shown in Exhibit VII-11.



EXHIBIT VII-11

NOTIFICATION OF PERSONAL COMPUTER HARDWARE/SOFTWARE PURCHASE

To: Purchasing

Date:

1. Department Name, Location, ID Number:						
2. Description of Hardware/Software	Vendor Name	Price		Approved List		If No, Reason for Purchasing
		List	Discount	Yes	No	
3. Dealer Name:		Contract Dealer? Yes <input type="checkbox"/> No <input type="checkbox"/> If No, Why Used:				
4. For Items \$200 or More: Item Name: (Complete a separate form for each item.)						
a. Reason for Acquiring (use):						
b. Expected Benefits (quantify):						
c. Expected Savings (list):						
d. I.S., Internal Audit:						



- This form will identify exceptions in using the approved product and dealer list and the reasons for them.
 - These reasons may sometimes be legitimate and grounds for modification or expansion of the approved list.
 - In other cases, the information on this form will uncover purchases that are disruptive to PC planning and operations in the organization as a whole.

3. MONITORING VALUE

- A key part of the Notification Form is the section describing expected benefits and savings. The benefits and savings should be made as concrete as possible.
 - A follow-up to the Notification Form is the reporting of actual results. Exhibit VII-12 shows how this type of information should be collected.
 - The tightness or looseness of this procedure can properly vary from company to company. While it may not be a tight financial test, neither should the forms be accumulated unread. At the least, the successful implementors' experiences should be analyzed and publicized so that others can benefit from knowledge of the most successful practices.

4. MONITORING: SUMMARY

- Exhibit VII-13 summarizes the monitoring process. Three basic activities are involved, each of which has an implementing form described earlier in this chapter.



EXHIBIT VII-12

RESULTS FROM USE OF PURCHASED PERSONAL COMPUTER
HARDWARE/SOFTWARE

Instructions: Complete this form for all personal computer hardware or software with a purchase price of \$200 or more. Submit to the Personal Computer Coordinator six months after the hardware or software item has been installed.

1. Hardware/software item description: _____

2. Date on notification form: _____
3. Date installed: _____
4. Benefits:
 - a. Expected: _____

 - b. Actual: _____

 - c. Comment: _____

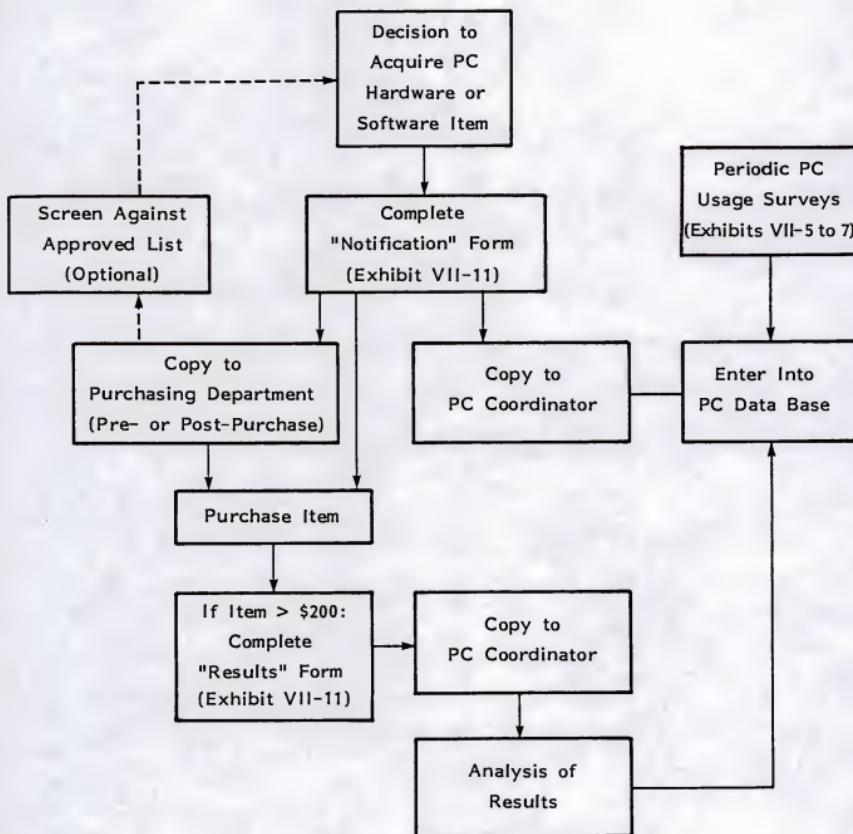
5. Savings:
 - a. Expected: _____

 - b. Actual: _____

 - c. Comment: _____



EXHIBIT VII-13
MONITORING PROCESS





- These three forms should not entail a significant amount of additional effort, yet they can produce a wealth of valuable management and planning data.

I. PAYOFF: A PERSONAL COMPUTER DATA BASE

- The data collected to monitor the adherence to standards can be used to construct and maintain a data base of personal computer usage. Exhibit VII-14 shows the major data elements, arranged by department.
 - PC DBMS software should be used for this, both to give IS real-life experience and as an internal marketing effort to show the capabilities of the PC.
 - If the data base is expected to be multipurpose, one of the more comprehensive DBMS packages will be necessary (such as dBase II).
 - Otherwise, one of the simpler packages for generating reports will suffice, such as Databex or VisiFile.
- Exhibit VII-15 shows the types of reports that can be generated from the PC data base. These reports can be used by:
 - The PC coordinator - for planning and reporting progress to IS and general management.
 - General management and corporate internal audit - to ensure that designated standards are being followed.
 - User groups - to enroll new members in general and specialist groups, and to put similar users in touch with one another.



EXHIBIT VII-14

PERSONAL COMPUTER DATA BASE (SCHEMATIC)

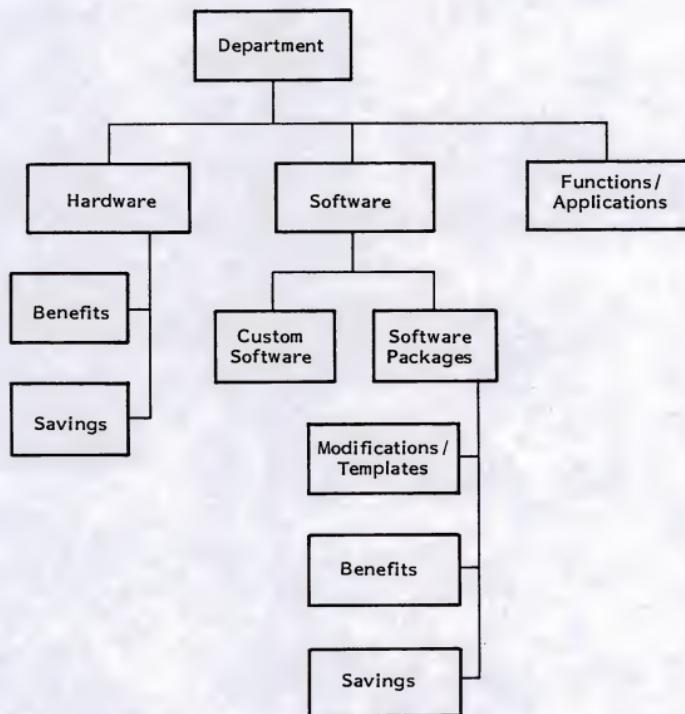
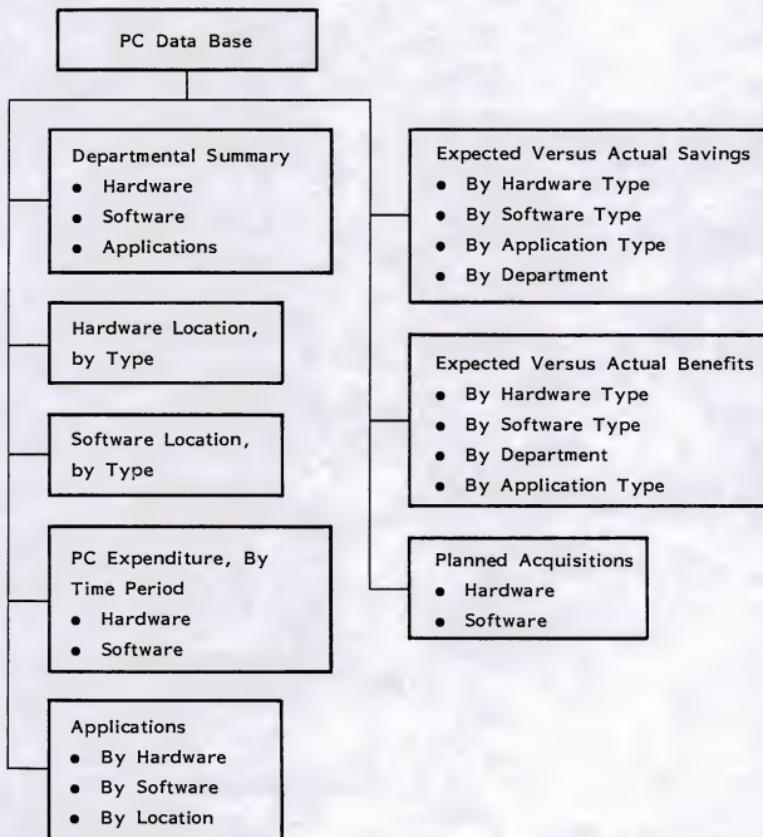




EXHIBIT VII-15

PERSONAL COMPUTER DATA BASE REPORTS





- Department heads - to keep track of their PC activities.
- Word processing and similar equipment could be added to the data base and to the monitoring process, depending on the needs of the corporation and the uses to which the word processing equipment is being put.
 - This may become a more important issue in the future as word processing vendors and third-party vendors add PC-like capabilities to office systems. Examples include:
 - Powerful spreadsheet programs now being introduced for the Wang Alliance/OIS system.
 - Applications and systems support software for the IBM Displaywriter.

J. SUMMARY

- The main responsibility of IS and the PC coordinator will be to gain the confidence of key departments and leading-edge PC users on:
 - The need for planning which is as comprehensive as possible.
 - The virtues of buying consistent hardware and software.
 - The value that IS can add to the department's or individual's PC efforts.
- However, the success (and contents) will often be determined by user group enthusiasts.



- The coordinator and user groups will between them be responsible for establishing and maintaining PC standards or guidelines. The more the user groups are involved, the greater the chance for voluntary adherence.
- The PC coordinator is the logical person to negotiate agreements with vendors. Initially, these agreements would focus on purchase terms and conditions, especially price and discounts. On an ongoing basis, the coordinator will be more concerned with support, training, and equipment maintenance.
- IS, through the PC coordinator, has other sources of influence over the course of PC development in the organization:
 - Vendor contracts establish attractive price and service arrangements for favored equipment.
 - The IS support staff and, to a large extent, the user groups will focus on a relatively narrow range of PC hardware and software.
 - The newsletter, being under semi-official control, will reflect IS views and needs. (It is also important that it reflect unofficial viewpoints if it is to be useful and credible).
 - Obviously, if the standards and guidelines are followed, they will directly affect PC development. But, if they are too complex and comprehensive, they will not be observed by the typical PC user. This is especially true if the standards and guidelines are imposed on the organization instead of being jointly agreed to by the organized users.
 - Joint agreement, while more desirable in the long run, may initially take up more IS staff time. Moreover, the results may not seem professional enough to those in IS who write internal IS standards.



- Trying to obtain too much may result in disappointing results. A voluntary acceptance of minimum standards could assist IS in building bridges to users in non-PC areas.
- An example of such bridge-building is the informal cooperation and exchange of views that can occur between user departments and their opposite numbers in conventional IS application groups.



APPENDIX A: QUESTIONNAIRE



000009

PERSONAL COMPUTER QUESTIONNAIRE

1a. How many personal computers are currently in use in your department? Which manufacturers are they from? (GET NUMBER OF SYSTEMS FOR EACH MANUFACTURER)

<u>MANUFACTURER</u>	<u>NUMBER OF SYSTEMS</u>
Apple II or III	_____
TRS-80 (Tandy, Radio Shack)	_____
Xerox 820	_____
IBM PC (5150)	_____
Osborne	_____
HP 125 or 85, 86, 87	_____
Other	_____

TOTAL	_____

1b. How many have printers?

_____ or _____ %

1c. Is your personal computer connected by a communications line to an:

() In-house mainframe
() Outside service
() Other personal computers

2. How long ago did you get your first personal computer system?



3. What are the most important uses or applications that your personal computer(s) are being used for?

4a. Which software packages have you purchased?

4b. What software have you had specially written for your use?

4c. Have personnel in your department written any of their own programs?

YES NO

5. In general, how satisfied is your department with your personal computer(s)?
(5=High, 1=Low) _____

o Why? _____



6a. How reliable would you say your system(s) have been overall?

(5=High, 1=Low) _____

o Why? _____

6b. Do you back up your data and programs?

() YES () NO

If YES:

o Do you have any problems in doing so?

() YES () NO

Discuss _____

*7. What have been your most important sources of assistance, both in getting started and in on-going operations? (PROMPT ONLY IF NECESSARY: e.g., Outside consultant, MIS staff, personal computer vendor, computer store, books and manuals).

() Outside consultant
() MIS
() Vendor
() Store
() Books
() Other _____



*8a. Do you expect to be purchasing additional equipment in the next 12 months?

YES NO

If YES, Describe _____

*8b. Do you expect to be adding more software in the next 12 months?

YES NO

If YES, from what source? _____

*9. Where are your personal computer expenses budgeted? (PROMPT IF NECESSARY; MAY HAVE MORE THAN ONE SOURCE)

In department's MIS budget
 In department's office equipment budget
 In department's administrative budget
 In corporate MIS budget
 In corporate personal computer budget
 Other (describe) _____

*10. How many employees are in your department? _____

*11. Does your department also have one or more terminal (that are not personal computers) connected to a mainframe computer?

YES NO



*12. What do you think the use of personal computers in your department will be in five years, compared to now?

*Ask those with no PCS installed, but plan to in future.



APPENDIX B: SELECTED PERSONAL COMPUTER
OFFERINGS



APPENDIX B
SELECTED PERSONAL COMPUTER OFFERINGS

VENDOR	MODEL	PRICES (APPROXIMATE)			COMMENTS
		CPU, KEYBOARD FLOPPY(S)	PRINTER (DM = Dot Matrix LX = Letter Quality)	HARD DISK	
Alpha-Micro	1051	\$31,600 (w/ hard disk)	—	—	Small business computer
Altos	8000-10	\$8,000	—	\$5,000	High performance; sold in CDC business centers
Apple	II	\$2,600	\$400-700	—	—
Apple	III	\$4,000	—	—	16 bit
Commodore	8032	\$1,500	DM: \$1,000	5 Meg: \$3,000	European leader
Commodore	8096	\$2,000	LQ: \$2,200	7.5 Meg: 3,500	—
Corvus	Concept	\$7,000	DM: \$2,000 LQ: \$3,200	6 Meg: \$3,200 11 Meg: \$4,800	16 bit
Cromemco	—	\$6,500	DM: \$1,000-1,500 LQ: \$2,400	11 Meg: \$7,000 22 Meg: \$12,000	Early CP/M machine
DEC	Rainbow 100	\$7,700	DM: \$850-2,200	\$3,500-4,200	All except DECMATE are new models; can run PDP software
DEC	DecMate 2	\$3,750	LQ: \$2,800	—	
DEC	Professional 325	\$5,900	—	—	
DEC	Professional 350	\$7,800	—	—	—

Continued



APPENDIX B
SELECTED PERSONAL COMPUTER OFFERINGS (Cont.)

VENDOR	MODEL	PRICES (APPROXIMATE)			COMMENTS
		CPU, KEYBOARD FLOPPY(S)	PRINTER	HARD DISK	
Dynalogic	Hyperion	\$5,000	-	-	16 bit
Eagle	3	\$4,000	-	\$2,000	-
Hewlett-Packard	HP 87	\$3,000	DM: \$1,200	-	Large capacity; graphics
	HP 125	\$2,750	-	-	-
IBM	Personal Computer	\$5,000	DM: \$550	-	16 bit
North Star	Advantage	\$3,600	DM: \$550	\$5,000	8 bit, early CP/M machine
North Star	Advantage 816	\$5,200	LQ: \$1,500	-	16 bit
Osborne	Osborne 1	\$1,800	-	-	Portable; bundled software
Radio Shack	TRS 80-Model II	\$3,500	-	5 Meg: \$4,500	-
Radio Shack	TRS 80-Model 16	\$5,000	-	-	16 bit
Vector Graphic	2600	\$5,000	DM: \$950	\$5,000	-
Vector Graphic	4	\$5,200	LQ: \$1,500-3,200	-	-
Wang	Professional	\$5,000 (?)	-	-	To be introduced 2/83
Zenith	Z89	\$3,500	-	-	-
Zenith	Z110	\$4,500	-	-	16 bit



APPENDIX C: HARDWARE VENDOR PROFILES



APPENDIX C: HARDWARE VENDOR PROFILES

A. APPLE COMPUTER, INC.

10260 Bandley Drive

Cupertino, CA 95014

(408) 996-1010

1. BACKGROUND

- Apple Computer, Inc. was founded in 1976. In 1977 the company introduced its Apple II system, which was sold primarily through independent distributors, franchises, and a small number of company-owned stores.
- In November 1981, Apple opened a 40,000 square foot assembly plant in Cork, Ireland.
- Apple acquired Microsense Computer, Ltd. as its authorized distributor in the United Kingdom in February 1981.

2. GROWTH

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
Total Revenue (\$ millions)	\$.8	\$ 8.0	\$ 48	\$ 117	\$ 335
Annual Growth Rate over the Previous Year		900%	500%	145%	185%



- Apple increased its manufacturing facilities from 280,000 square feet in 1980 to 670,000 square feet in 1981. This was an increase of 139%.

3. CURRENT PRODUCTS

- Introduced in 1977, the Apple II replaced the initial system, which had been designed primarily for the hobbyist market. The maximum selling price remained below the \$2,000 level until the 1979 announcement of the Apple II PLUS with an extended BASIC in ROM. The enhancement alone did not increase the price, but it allowed optional packages, such as Applesoft II, a firmware card with Auto-Start in ROM to be added, thus making turnkey software resident in ROM available to the user once the Apple II was turned on.
 - Apple II's operating system is the Apple DOS 3.3.
 - Apple II's microprocessor is the 6502.
- The Apple III was reintroduced in 1981. Designed principally for business applications, the Apple III is a compatible, upward expansion of the Apple line designed for managers, financial analysts, administrators, and professionals. Internal memory is expandable to 256K-bytes.
 - Apple III's operating system is SOS.
 - Apple III's microprocessor is the 6502.
 - Apple III's price will range from \$3,495 to \$6,990 suggested list, depending on the configuration.

4. DISTRIBUTION CHANNELS

- Apple has a worldwide dealer network totaling 3,000 authorized dealers. Apple's dealer service and support infrastructure in the U.S. and Canada



exceeds 1,000 locations which are backed up by Apple's own distribution and service centers at six U.S. and three international sites.

5. FUTURE DIRECTION

- Apple will introduce LISA (or Super II) in January 1983, a less expensive and more powerful system than the Apple II.
- It is anticipated that Apple will introduce a 16-bit machine during the summer of 1983. The new computer is expected to be very sophisticated and will compete directly with IBM, Radio Shack, and DEC entries.
- Apple's probable future direction has a heavy emphasis on office functions for business applications. INPUT does not expect it to move into competition with home/entertainment computers such as Atari.

B. TANDY (RADIO SHACK)

1800 One Tandy Center

Fort Worth, TX 76102

(817) 390-3700

I. BACKGROUND

- The Tandy Corporation acquired Radio Shack in 1963 as part of an integrated strategy aimed at a profit center concept of operations little used in retail merchandising. Through Radio Shack, the company introduced its TRS-80 in August 1977. The merchandising expertise of the Tandy Corporation coupled with the talents of Radio Shack dealers provided the main stimulus for the skyrocketing success of the new product; it was initially designed for personal and hobbyist use, but the general business public was quick to realize the potential benefit of small, standalone systems.



2. GROWTH

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1977-1981</u> <u>AAGR</u>
Total Revenue (\$ millions)	\$949	\$1,059	\$1,216	\$1,385	\$1,691	
Annual Growth Rate over the Previous Year		12%	15%	14%	22%	16%

- The Radio Shack division represents nearly 100% of Tandy's overall net sales.
- Of the net sales figures, microcomputers, software, and peripheral equipment represent the following proportions:

<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
0	2%	10%	15%	22%

3. CURRENT PRODUCTS

- The TRS-80 is available in four models. The Model I is the low end of the product. The Model II is Radio Shack's popular business and educational machine. The Model III is a general purpose computer, and Model 16 is the newest Radio Shack computer.
- The TRS-Model 16 was the industry's first personal computer with a 16-bit chip. Radio Shack's is impressive in that it offers the Motorola 68000 CPU, one of the current state-of-the-art microprocessors. The Model 16 is significant because it can operate programs written for Tandy's previous generation of TRS-80 Model II computers, as well as more powerful programs Tandy plans to provide for the Model 16 later this year. The Model 16 also incorporates the Z-80 8-bit microprocessor allowing the Model 16 to use the vast catalog of 8-bit software written for it.



- The Model 16, with a built-in 8-inch disk storage device and 128,000 characters of main memory, is \$4,999. Memory can be expanded to 512,000 characters. Hard-disk can also be included which can store 8.4 million characters.

4. DISTRIBUTION CHANNELS

- Tandy currently distributes retail electronics to the world market through 5,147 company-owned retail stores plus more than 3,000 dealer/franchise outlets. In number of outlets, Radio Shack is the largest retail electronics chain in the world.

5. FUTURE DIRECTION

- Tandy will be offering a kit which will enable owners to upgrade their existing Model II computers into a Model 16, an option not commonly offered outside the mini and mainframe world. This kit is expected to cost \$1,499.
- Tandy aims to compete head to head with Apple and IBM in the professional business market, the home, and education.

C. COMMODORE INTERNATIONAL LIMITED

Valley Forge Corporate Center
950 Rittenhouse Road
Norristown, PA 19403
(215) 666-7950

I. BACKGROUND

- Commodore was founded in 1958 as Commodore Business Machines (Canada) Ltd. by its current vice chairman and chief executive officer, Jack Tramiel. In 1970, still primarily a marketing organization, it entered the calculator business. In 1975 Commodore suffered industrywide problems and lost \$5



million on sales of \$56 million. At that point Commodore altered its philosophy to one of integration. It survived to buy and turn around several troubled semiconductor houses and eventually entered the personal computer business with the first computer system under \$1,000.

2. GROWTH

	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1978-1981 AAGR (percent)</u>
Total Revenue (\$ millions)	\$ 50	\$ 71	\$ 126	\$ 187	
Annual Growth Rate over the Previous Year	9%	42%	77%	49%	55%

3. CURRENT PRODUCTS

- The VIC-20 is a full-featured, expandable, color computer priced at under \$1,000. The VIC 20 features color, sound, programmable function keys, 5K-bytes of memory expandable to 32K and built-in BASIC. VIC utilizes the 6502 microprocessor.
- The Pet 4000 series is basically an educational and scientific computer, combining keyboard, display, and processor in one unit. The 4000 offers 34K or 50K combined RAM/ROM memory, utilizing the 6502 processor. The standard language for the 4000 series is BASIC.
- The CBM 8000 series is aimed primarily at business and professional markets, to be used as a management tool. Available ROM memory is 18K, RAM memory is 32K or 96K. The microprocessor is the 6502, utilizing DOS 2.5 as the operating system and BASIC as its programming language.
- The SuperPET 9000 series is a 16-bit computer that was introduced to the personal computer market during the spring of 1982. The SuperPET is based on the CBM 8032 system incorporating the use of the 6502, 8-bit and the 6809,



16-bit microprocessor. This enables the SuperPET to use all the software designed for the 8032 machine as well as the advanced 16-bit software designed for the 9000 series. ROM memory available is 36K, RAM is 96K. The standard languages used with the SuperPET are: CBM BASIC 4.0, Waterloo microBASIC, microPASCAL, microFORTRAN, microAPL, and Assembler (6809).

4. DISTRIBUTION CHANNELS

- In the United States, Commodore distributes through company-owned stores, Macy's, Emporium Capwell's, specialized national store chains (e.g., "Photo and Sound" handling VIC-20), and a number of independent and franchised retail computer stores.
- In Europe where Commodore's name is best known, an elaborate distribution chain has been established using office equipment dealers as primary dealers. One hundred million dollars of the \$132 million in computer sales comes from the European market.

5. FUTURE DIRECTION

- Commodore recently entered into a five-year agreement with TRW to service and maintain Commodore microcomputers throughout the United States.
- Commodore will shortly introduce a CP/M add-on board with a Z-80 CPU, to enable its users to draw on the vast program library of applications now running under CP/M.
- Commodore recently demonstrated its office-of-the-future concepts at an international computer show in the United Kingdom. With an emphasis on communications, Commodore demonstrated networking systems and Commodore computers connected to most mainframe computers, including IBM and Digital Equipment.



D. IBM CORPORATION

Systems Products Division
P.O. Box 1328
Boca Raton, FL 33432
(305) 998-6076

1. BACKGROUND

- IBM is the largest provider of computer services and hardware in the world, with a 1981 gross income (from sales, rentals, and services) of \$29,070,000,000.
- In the fall of 1981, IBM announced its official entry into the personal computer market with the IBM Personal Computer. The IBM Personal Computer will compete primarily for the business and professional markets against DEC, Apple, and Radio Shack.

2. GROWTH

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1977-1981 AAGR (percent)</u>
Total Revenue (\$ millions)	\$18,133	\$21,076	\$22,862	\$26,213	\$29,070	
Annual Growth Rate (percent)	11%	16%	8%	15%	11%	13%
Number of IBM Employees	310,155	325,517	337,119	341,279	354,936	

3. CURRENT PRODUCTS

- The current products section will be restricted to IBM's Personal Computer. This is because of the vast number of products IBM offers. The IBM Personal Computer features the CP/M-86 operating system, utilizing the Intel 8088



microprocessor. Optional to the Personal Computer are a display, a printer, and floppy disk drives. The price ranges from \$1,565 to \$4,500. RAM memory begins at 16K and expands to 256K. The high-level languages offered with the Personal Computer are BASIC and PASCAL.

- IBM has been selling personal computers since the mid-1970s in various forms.
 - Certain minimal configurations of the 5100 series qualify for INPUT's definition of personal computers.
 - The Displaywriter and the Data Master are also essentially low-cost personal systems.

4. DISTRIBUTION CHANNELS

- In an uncommon move, IBM will venture outside its company-owned distribution channels to sell the Personal Computer by Computerland and Sears Roebuck in addition to their own product centers and national account salesmen.

5. FUTURE DIRECTION

- IBM will be very successful in the Fortune 1000 market, depending heavily on its national accounts as a point of entry with the personal computer.
- In order for the IBM Personal Computer to be truly useful, software must be developed quickly. IBM has been encouraging outside vendors in an effort to generate good 16-bit software.



E. XEROX CORPORATION

Stamford, CT 06904

(203) 329-8700

1. BACKGROUND

- Xerox Corporation is the largest manufacturer of reprographics in the world today; the name Xerox is literally synonymous with reproducing systems.
- In 1979 Xerox's Japanese affiliate, Fuji Xerox, was awarded the Dr. Deming Prize for excellence in quality and productivity of low-end copiers.
- In December 1979 Xerox introduced Ethernet network, an intraoffice communication system designed to link free-standing electronic information processing machines.
- On June 9, 1981 Xerox announced the Xerox 820 personal computer which doubles as a low-volume word processor. This announcement by W. Dal Berry, vice president and general manager of Xerox's Office Products Division, was a formal statement of Xerox's intentions to shape and market the office-of-the-future concept.

2. GROWTH

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1977-1981 AAGR (percent)</u>
Total Xerox Revenue (\$ millions)	\$ 5,190	\$ 6,018	\$ 6,996	\$ 8,197	\$ 8,691	
Annual Growth Rate (percent)	14%	16%	16%	17%	6%	14%
Number of Xerox Employees (thousands)	107	108	116	120	121	



3. CURRENT PRODUCTS (PERSONAL COMPUTERS)

- The Xerox 820, introduced in 1981, is a multifunction machine combining word processing and personal computer capabilities. The 820 is designed for the following applications and much more:
 - Word processing.
 - General ledger.
 - Job costing and scheduling.
 - Financial analysis.
 - Generating business scenarios.
 - Inventory control.
 - Engineering.
 - Real estate.
 - Management forecasting.
 - Medical billing and accounting.
- The 820 uses the Z80 microprocessor with 64K RAM memory and 4K/ROM, dual 5½" single-sided floppy disk drives, CP/M operating system, BASIC 80, C BASIC, and COBOL 80. Xerox also provides communications software for Teletype emulation and IBM 3270 emulation.
- The Xerox 820 can be described as an all-around small business machine or as an advanced home computer. In the office environment, the 820



is intended as an integral part of a fully integrated office linked by Ethernet network.

4. DISTRIBUTION CHANNELS

- The Xerox is sold primarily through Computerland retail computer stores and Xerox stores.

5. FUTURE DIRECTION

- Because of the 820's ability to act as an intelligent terminal communicating with large IBM mainframes, Xerox will be aiming its marketing attack at the top 1,000 industrial companies in the U.S. where the office of the future will be shaped.

F. CROMEMCO, INC.

280 Bernardo Avenue
Mountain View, CA 94043
(415) 964-7400

I. BACKGROUND

- Cromemco is unique to the small computer industry in that it began in 1976 without any outside investment. It has achieved remarkable success since that time continuing on its own financial merits. Cromemco remains a wholly owned company by its two cofounders, Harry T. Garland and Roger D. Melen, both 34 and recipients of doctorates from Stanford.
- Cromemco began at the high end of the microcomputer field, emphasizing quality and reliability over price. A full top-of-the-line base unit sells for about \$8,000, and a complex six-user system for over \$18,000.



2. GROWTH

	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1980</u>	<u>1976-1981</u> <u>AAGR</u>
Total Cromemco Revenue (\$ thousands)	\$ 600	\$4,000	\$11,000	\$30,000	
Annual Growth Rate (percent)		566%	175%	172%	268%

- Cromemco employs more than 400 people.

3. CURRENT PRODUCTS (PERSONAL COMPUTERS)

- Cromemco offers four computer systems, the System Zero, System Two, Model Z-2H, and the System Three.
- The Basic System Zero is suited to dedicated as well as general applications. It is a Z-80A-based single card computer. RAM memory ranges from 1K-byte to 64K; ROM memory is 8K-bytes. System Zero utilizes RDOS-2 as its operating system. Basic's price range during 1981 was \$995 to \$2,995.
- The System Two Disk Computer is a highly professional computer operating from the Z-80A CPU, utilizing RDOS-II operating system. The price of this unit is \$3,990.
- The Z-2H is a powerful system which includes 11 megabytes of hard disk storage, two quad-capacity floppy disk drives, 64K RAM memory, and the Z-80A processor. Z-2H operates off of the Cromix operating system which is similar to the UNIX operating system but with added features. This hard disk computer system retails for \$9,995.
- The System Three disk computer incorporates the Z-80A processor, up to four floppy disk drives, and memory expansion to 512-K RAM in eight banks. The



Cromix multi-user operating system is included also. Prices range from \$10,000 to \$16,000.

4. DISTRIBUTION CHANNELS

- Cromemco distributes its products through a worldwide network of over 350 independently owned computer dealers and OEMs.

5. FUTURE DIRECTIONS

- Cromemco announced the introduction of its 16-bit computer system during the spring of 1982. This system incorporates both the Motorola 68000 16-bit microprocessor and the Zilog Z-80A 8-bit microprocessor, making the system compatible with its existing Z-80 based product line. The 68000 based System One computer will range in price from \$5,495 to \$6,495. The System Three computer will range in price from \$8,495 to \$9,995.

G. ALTOS COMPUTER SYSTEMS

2360 Bering Drive
San Jose, CA 95131
(408) 946-6700

I. BACKGROUND

- Altos Computer Systems was founded in 1977 by British-born David Jackson. Altos is a designer of a family of systems based primarily on the Z-80A microprocessor. The computers are manufactured by Altos, and peripherals such as keyboard, printer, and visual display are obtainable from several different commercial sources. The philosophy of Altos is to fill the needs of a wide market; it accomplishes this goal by providing many options in hardware, software, and languages, which allow for easy upgrading.



2. GROWTH

	<u>1978</u>	<u>1981</u>	<u>1982</u>
Total Altos Revenue* (\$ thousands)	\$200	\$21,000	\$60,000**

* San Jose Mercury News - 2/1/82, source of information
** 1982 estimated FYE - revenues

3. CURRENT PRODUCTS

- Currently Altos is offering four basic configurations in the 8000 series: the ACS 8000-2, 8000-7, 8000-10, and 8000-15. They also offer a 16-bit machine, the ACS 16000-10.
- ACS 8000-2 comes with 6K RAM and provides up to 1/M-bytes additional RAM with dual floppy disk drives. The Z-80A is 8000-2's microprocessor utilizing MP/M, CP/M, OASIS, or PASCAL as operating systems.
- ACS-8000-7 comes with 208K-bytes of RAM, expandable to a 29M-byte, hard disk, multi-user system with an integrated magnetic tape backup. The Z-80A is the microprocessor utilizing MP/M, CP/M, or OASIS as operating systems.
- ACS-8000-10 comes with 208K-bytes of RAM expandable to 20-40M-bytes. The 8000-10 is a Z-80A based machine utilizing MP/M, CP/M, OASIS, and PL/C as operating systems.
- ACS-8000-15 is a Z-80A based machine offered with standard 208K-bytes of RAM memory. 8000-15 is upgradable to 8" or 14" hard disks. Operating systems available are the same as the 8000-10 with the Z-80A as its microprocessor.
- ACS-16000-10 is an Intel 8086-based machine which comes standard with 1m-byte of RAM memory. It has MP/M 86, CP/M 86, OASIS 86, and XENIX as its operating systems.



4. DISTRIBUTION CHANNELS

- Altos sells its computers to OEMs and distributors who distribute in turn through a variety of networks.

5. FUTURE DIRECTION

- Altos plans to introduce office computer systems that can connect hundreds of users at terminals located in separate buildings, all accessing the same data base.
- Altos plans to compete directly with Convergent Technologies by introducing a limited distributed-data processing system with individual terminals built around microprocessors.
- Altos plans to boost its system's power by adding the Motorola 68000 CPU. Altos wants both Intel's 8086 and the Motorola 68000 in order to capture as large a market share as possible.

H. NORTH STAR COMPUTERS, INC.

14440 Catalina Street
San Leandro, CA 94577
(415) 357-8500

I. BACKGROUND

- North Star Computers, Inc. is the industry's first company to announce a personal computer offering bit-mapped graphics. As of August 1981, approximately 30,000 North Star systems had been sold. North Star was founded in June 1976 by Charles A. Grant and Mark L. Greenberg. Both of these men are Ph.D.s who were originally staff members at U.C. Berkeley Research Center.



2. GROWTH

	<u>1977</u>	<u>1981</u>	<u>AAGR (percentage)</u>
Total North Star Revenue (\$ millions)	\$2.6*	\$25.0**	175%

* First full year of North Star's operations
** Estimate

3. CURRENT PRODUCTS

- North Star Computers, Inc. offers two very successful personal computers, the North Star "Horizon" and the "Advantage."
- The North Star Horizon was introduced in 1977, and it was one of the first small or personal computers to incorporate low-cost minidiskette capability. The Horizon utilizes a Z-80 microprocessor with one or two integrated double density or quad-capacity minidiskette drives. The operating systems include PASCAL which has its own operating systems, CP/M which supports both hard and floppy disk, and Disk Operating System (DOS 5.2) for disk systems. The price range of the Horizon is \$4,700 for the 32K-byte system with two double density diskette drives and a black and white screen, to \$14,000 for a 64K-byte system including a printer and two quad capacity diskette drives. Horizons are primarily used for scientific and business applications.
- The Advantage is aimed at the upper end of the office systems market providing graphics capability. The machine is Z-80 based with 64K-bytes of RAM and is capable of producing bar charts, pie charts, 3-D visuals, and plotted graphics. The operating systems included are Graphics DOS (disk-based) and CP/M. With graphics capability, the computing unit costs \$4,000. A typical configuration including 5M-bytes external disk storage and a letter quality printer costs about \$14,000.



4. DISTRIBUTION CHANNELS

- North Star distributes both of its computers through distributors to dealers as well as OEMs. During 1981 Computerland became a major distributor. General Binding Company, a leader in specialized binding equipment, signed a \$25 million, three-year agreement with North Star to distribute Advantage and Horizon Computers under a private label.
- North Star has a direct distributor support facility located in Munich, Germany for European distribution.

5. FUTURE DIRECTION

- North Star is striving to continue its current growth rate and expects to crest the \$200 million mark by 1985.
- In January 1982, MAI Sorbus Service contracted to provide third-party maintenance for North Star on an national basis.

I. HEWLETT-PACKARD COMPANY

3000 Hanover Street
Palo Alto, CA 94304
(415) 857-1501

I. BACKGROUND

- Hewlett-Packard is one of the major designers and manufacturers of precision electronics equipment for measurement, analysis, and computation in the world today. Hewlett-Packard produces more than 4,500 products which are sold worldwide and cover a broad spectrum of applications within the science, engineering, business, industry, medicine, and educational sectors.



- The primary product categories are computers/systems, calculators, computer/calculator peripheral products, test and measuring equipment, medical electronic equipment, and instrumentation for chemical analysis.
- Hewlett-Packard is ranked among the top U.S. industrial organizations for the proportion of sales dollars invested in product development. Hewlett-Packard invests \$0.9 of every sales dollar in product development - approximately \$322 million for fiscal year 1981.

2. GROWTH

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1977-1981 AAGR (percent)</u>
Total HP Revenue (\$ millions)	\$ 1,368	\$ 1,737	\$ 2,361	\$ 3,099	\$ 3,578	
Annual Growth Rate (percent)	22%	27%	36%	31%	15%	27%
Number of HP Employees (worldwide)				57,000	64,000	

3. CURRENT PRODUCTS (PERSONAL COMPUTERS)

- Hewlett-Packard currently offers three personal computers: the H/P 125, 83, and 85. All three computers are aimed at the professional market and cover a wide spectrum of applications.
- The H/P 125 was first introduced during the summer of 1981. It was intended to compete with IBM and Xerox in the personal computer market. The 125 utilizes CP/M as its operating system and is based on twin Z-80A microprocessors. The 125 is offered in two configurations: a dual 5 1/4" floppy disk with 500K-bytes of storage, or with dual 8" floppy disks and 2.4 megabytes of storage. The H/P 125 is priced at \$7,460 with the 5 1/4" dual floppy configuration.



- The H/P 83 and 85 are designed for industry/professional use with the ability to expand via peripherals and software as the users' needs develop. The 83 and 85 have an H/P solid state, 8-bit microprocessor, with 32K-bytes of RAM memory. These two computers use an H/P operating system. The H/P 83 with dual floppy disk is priced at \$3,600. The H/P 85 with dual floppy disk is priced at \$3,950. These two models also have 8" floppy disk and 5 $\frac{1}{4}$ " Winchester flexible disk drives available to them.

4. DISTRIBUTION CHANNELS

- Hewlett-Packard distributes its personal computers factory-direct through sales representatives and, occasionally, through OEMs.
- The only exception to this method is the new H/P-87 personal computer, which will have Computerland retail stores as a distributor.

5. FUTURE DIRECTION

- Hewlett-Packard intends to be a major force in the personal computer world as evidenced by its most recently unveiled personals, namely, the H/P-87, and the H/P-9836 desk top.
- The H/P-87 is positioned to compete directly with the IBM Personal Computer and the Apple III. The 87 is designed for the analytical professional, which will include scientists and electronic engineers. The CPU for the 87 is a custom-designed 8-bit H/P-MC-6802 model. It has as its operating system, a CP/M plug-in module for \$495. The 87 system ranges in price from \$3,995 to \$7,995.
- The H/P 9836 A desk-top computer enables the user to gather, interpret, and graphically display data quickly. It greatly increases the range of computer-aided engineering application. With RAM PASCAL, 5 $\frac{1}{4}$ " dual floppy disks, 256K-bytes RAM memory, and H/P VisiCalc, the top end price will be \$15,700.



J. DIGITAL EQUIPMENT CORPORATION

146 Main Street
Maynard, MA 01754
(617) 897-5111

1. BACKGROUND

- Digital Equipment Corporation was founded in 1957. Its first Programmed Data Processor (PDP), the PDP-1, a high speed, 18-bit small computer with 32K of addressable core memory, was delivered in December 1959 at a price of \$120,000. PDP-2 and PDP-3 prototypes never reached the production stage.
- The first PDP-4 was delivered in 1962 with slower memory at a price of \$65,000.
- The PDP-5 has been acknowledged as the first commercially available business minicomputer. The 12-bit machine (the forerunner of the PDP-8) was introduced in 1963.
- The PDP-8 was announced in 1965 just as competition introduced systems comparable in price/performance to PDP-5.

2. GROWTH

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1977-1981 AAGR (percent)</u>
Total Revenue (\$ millions)	\$1,059	\$1,437	\$1,804	\$2,368	\$3,198	
Annual Growth Rate (percent)		36%	26%	31%	35%	32%
Number of DEC Employees (thousands)	36.7	39.0	44.0	55.5	63.0	



3. CURRENT PRODUCTS

- DEC announced the PDP-9, PDP-10, and PDP-11 series, as well as the PDP-12 and PDP-14 in 1968 and 1969, respectively. There are several DEC minicomputers that can be configured as complete freestanding workstations, which include (prices are approximations):
 - PDP - 8/E - (8K CPU) tape drive, CRT and 30 CPS printer - \$14,865.
 - PDP - 11/03 - (16K plus dual floppy disk, DECWRITER II) - \$10,000.
 - Datasystem 150 (32K) - \$10,900 or (60K user memory) \$11,600.
 - DECstation 78/40B - \$7,995; 78/70D - \$12,400 (both 16K)
 - DECstation 88/50-D (32K) - \$11,500, includes VT-100 CRT (88/50-L costs the same, but with LA180 printer added - \$14,400).

4. DISTRIBUTION CHANNELS

- DEC's computers will be sold in its own 25 retail stores, by DEC's sales force, and in stores franchised by Computerland.

5. FUTURE DIRECTION

- In the spring of 1982 DEC announced its entry into the personal computer market with three computers:
 - The Rainbow 100 is the least expensive of the three and will compete against the IBM and Apple personal computers. The Rainbow has two microprocessors: the 8-bit Z-80 and the 16-bit 8088 Intel chip. CP/M will be the operating system used. The price, with 64K RAM and 800,000 bytes of memory on the drives, will be \$3,495.



- Professional 350s and 325s are intended for business use only and can run the same software as DEC's PDP-11 minicomputer.
- The DECMATE II is a more powerful version of DEC's earlier word processing system and can also run the CP/M operating system.
- The price range of all three of these computers will be between \$3,000 and \$5,000.



APPENDIX D: SOFTWARE VENDOR PROFILES

A. VISICORP

2895 Zanker Road
San Jose, CA 95134
(408) 946-9000

1. BACKGROUND

- Since beginning in 1978 on a \$500 investment, Visicorp has become the world's leading producer of personal computer applications software. Its most popular and most recognizable software package, "VisiCalc," has sold in excess of 300,000 copies since 1979.
- VisiCalc is directly responsible for opening up the business market to personal computers.
- Visicorp is a privately held company with the majority of its ownership held by employees.

2. GROWTH

	<u>1980</u>	<u>1981</u>
- Total Visicorp Revenue (\$ millions)	\$ 4	\$ 20
- Annual Growth Rate (percent)	-	400%
- Number of Employees	-	100+



- WordStar is a highly versatile word processing package now known as the de facto standard for personal computers. The CP/M version costs \$495; the Apple version costs \$375. The Apple version requires substantial add-on peripherals.
- MailMerge is a powerful, multipurpose, file-merging program used with WordStar. The CP/M version is \$150; the Apple version, \$125.
- SpellStar is a spelling program that works with WordStar to find and correct spelling and typing errors in word processing. The CP/M version is \$250; the Apple version is \$195.
- DataStar is a data-handling program that allows one to enter, retrieve, and update data. DataStar interacts with WordStar, MailMerge, and SuperSort programs. The CP/M version is \$350; the Apple version, \$295.
- SuperSort is used for high-speed sorting, merging, and selecting information from data files with great flexibility. The CP/M version of SuperSort I is \$250, the SuperSort II, \$225; the Apple version SuperSort I is \$200, SuperSort II, \$150.
- WordMaster is a video text editor used mainly by programmers. The CP/M version is \$150.
- CalcStar is an electronic spreadsheet. The CP/M version is \$295; the Apple version, \$195.
- Apple II versions require the Microsoft Z-80 CP/M Soft Card, an 80-column video board, and 16K of additional RAM.
- Most MicroPro software programs are provided in 5 $\frac{1}{4}$ " single density disk format.



4. DISTRIBUTION CHANNELS

- MicroPro distributes its product to over 1,000 dealers in the U.S. It also distributes to 27 other countries through distributors with established dealer networks; OEMs, and large volume users which include education, government, and manufacturers who bundle MicroPro products with their computers.

5. FUTURE DIRECTION

- During the spring of 1982, MicroPro released "InfoStar," a powerful report generator/file processor with data handling capabilities.
- MicroPro is beginning to design its software for operation on several different operating systems in an effort to avoid being tied exclusively to CP/M hardware.

C. MICROSOFT, INC.

10800 N.E. Eighth, Suite 819
Bellevue, WA 98004
(206) 455-8080 Teléx 328945

I. BACKGROUND

- Microsoft began in 1975 with a single product, a BASIC interpreter for the 8080 personal computer. The Microsoft BASIC language now has 725,000 installations, more than any other single piece of software.
- Microsoft, Inc. designs, writes, and sells systems software for 8-bit and 16-bit microprocessors.
- Microsoft, Inc. was founded by Bill Gates and Paul Allen in 1975 when Bill Gates was 18 and Paul Allen was 21.



- Microsoft is made up of two divisions: the Microsoft OEM Division and Microsoft Consumer Products Division. The two divisions were formed to handle the distribution of software through these particular channels.
- On September 20, 1981, Microsoft received \$1 million of venture capital from Technology Venture Investors, a company based in Menlo Park, California.

2. GROWTH

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
Total Revenue (\$ thousands)	\$500	\$1,000	\$2,500	\$7,500	\$16,500
Annual Growth Rate (percent)		100%	150%	200%	120%
Number of Employees				85	130

3. CURRENT PRODUCTS

- Microsoft's revenue is derived from its software products and Softcard, a plug-in processor which allows Apple II and II+ owners to use software written for CP/M-based computers.
- Microsoft sells systems software packages for 8-bit and 16-bit personal computers, including languages, utilities, language subsets, and operating systems.
- The Consumer Product Division manufactures software in disk and cassette formats which include documentation. The products are described as follows:
 - Disk formats are 8" single side, single density; 5½" single side, double density; and 5½" standard format.
 - Software is offered for the CP/M, Apple DOS, TRS-80, ISIS-II, and TEKDOS operating systems.



- Language products offered are as follows:
 - BASIC-80 is an implementation of BASIC for 8080 and Z-80 microprocessors. With over one million installations, it is the leading BASIC interpreter used on most 8-bit microcomputers. BASIC-80 costs \$350.
 - BASIC Compiler increases the execution speed of programs run on BASIC-80 by three to ten times. BASIC Compiler costs \$395.
 - COBOL-80 is an implementation COBOL which offers improved interactive and user friendly capabilities over standard COBOL. COBOL-80 costs \$750.
 - FORTRAN-80 offers relocatable modules that are linked and loaded at run time. FORTRAN-80 costs \$500.
 - M/Sort is a sort utility which sequences records by a set of data keys supplied by the programmer. M/Sort allows full choice in the number and arrangement of sorting categories. M/Sort costs \$150.
 - Softcard is a hardware/software plug-in card for Apple IIs and II+s. It includes a Z-80 CPU and CP/M software. Softcard enables the Apple computer to operate any software developed for CP/M. Softcard costs \$300. Forty thousand units have been sold since Softcard's introduction during the summer of 1980.
 - Level III BASIC is an enhancement for Radio Shack's TRS series. Level III costs \$49.95.
 - Editor/Assembler-Plus is an editing, assembling, and debugging package for TRS-80 systems. Its cost is \$29.95.
 - Apple A.L.D.S. is an assembly language that enables programming in three different assembly languages: Z-80, 8080, 6502. It costs \$100.



- MicMath-80 symbolic math package allows a personal computer to perform algebra, trigonometry, calculus, integration, differentiation, and transcendental functions. MicMath-80 costs \$250.
- Microsoft's OEM Division licenses software products to microcomputer OEMs, who sell their products with Microsoft software bundled in. OEMs may also license software for their own use in product development. Over 250 OEMs use Microsoft software, including IBM, DEC, HP, TI, Apple, Radio Shack, Xerox, Matsushita, Mostek, Commodore, and Lanier. Operating systems offered to OEMs are Xenix and MS-DOS.
 - Xenix is a 16-bit CPU adaptation of Bell Laboratories' UNIX system.
 - MS-DOS is a disk-operating system for 8086/8088 16-bit microprocessors.

4. DISTRIBUTION CHANNELS

- Distribution of products is achieved through dealers, distributors, OEMs, and mail order.

5. FUTURE DIRECTION

- Microsoft announced a major series of applications tools for 1982:
 - Time manager, a personal calendar.
 - Project manager, a program for small project control.
 - Personnel manager, a data base management system for names.
- Xenix and MS-DOS will possibly be enhanced during 1982.



- In particular, MS-DOS will include disk buffering, graphics and cursor positioning, kanji support, multi-user and hard disk support, and networking.

D. LIFEBOAT ASSOCIATES

1651 Third Avenue
New York, NY 10028
(212) 860-0300

1. BACKGROUND

- Lifeboat Associates is an important publisher and distributor of proprietary software founded in 1977 by Tony Gold and Larry Alkoff.
- Lifeboat Associates is a mail-order retailer of software products for personal computers, primarily, and operating systems for minicomputers, secondarily.

2. GROWTH

	<u>1980</u>	<u>1981</u>
- Total Lifeboat Revenue (\$ thousands)	\$5,000	\$10,000
- Annual Growth Rate (percent)		100%

3. CURRENT PRODUCTS

- Lifeboat's library of software is too extensive to list individual packages; therefore, generic categories will be given with a systems requirement at the end of the section.
 - Systems tasks.
 - Telecommunications.



- Languages.
- Languages and application tasks.
- Word processing systems and aids.
- Data management systems.
- General-purpose applications.
- Mailing list systems.
- Financial accounting packages.
- Numerical problem-solving tools.
- Professional and office aids.
- Disk operating systems (8- and 16-bit machines).
- OEM services and products.
- The minimum personal computer system requirements for Lifeboat's software products are:
 - Operating systems: SB-80 or CP/M-80 (1.3 or later) or a compatible derivative.
 - Microprocessor: 8080/8085/Z-80 system.
 - Memory: 48K-bytes.



- Disk storage: 70K-bytes minimum.
- Disk drives: two drives.
- Any differences in the above requirements are identified by product.

4. DISTRIBUTION CHANNELS

- Lifeboat Associates is a publisher and distributor of proprietary software. It distributes its several hundred software packages by mail order to the following customers: end users, dealers, distributors, authors, and OEMs. Lifeboat Associates also provides the following services to its customers:

- Fully tested, reliable software.
- Wide spectrum of computer formats.
- Technical service "hot line."
- Customer service department providing facilities for mail, telephone, TWX, Telex, and personal sales.
- Offices on three continents.
- Export service delivering software to six continents.
- Growing network of dealers.
- Software desk reference.
- A monthly magazine covering new products, new versions, tips for personal computer users, and feature articles guiding the reader before and after purchase.



5. FUTURE DIRECTION

- Dealers have recently been allowed to receive discounts from Lifeboat without a minimum order on the number of software programs. This new program reduces bookkeeping and gives retailers more effective inventory control.

E. DIGITAL RESEARCH, INC.

Box 579
160 Central Avenue
Pacific Grove, CA 93950
(408) 649-3896

I. BACKGROUND

- In 1976 Gary Kildall founded Digital Research, Inc. Within three years CP/M (which Kildall created) was to become the primary product of his own million dollar company and the standard operating system for Z-80- and 8080-based personal computer systems.
- When Kildall originally developed CP/M, he anticipated that Intel would grasp the opportunity to fund further development of it as an Intel product, but Intel turned the project down.
- In August 1981 a four-way capital financing agreement was drawn up with venture capitalist/investment bankers - TA Associates, Hambrecht and Quist, Venrock Associates, and Page Mill Partners.
- In September 1981 Digital Research acquired Compiler Systems, Inc.
- In November 1981 Digital acquired MT Microsystems, Inc. of San Diego for an undisclosed amount of cash. Digital will market MT's PASCAL/MT plus programming language.



2. GROWTH

	<u>1980</u>	<u>1981</u>
- Total Digital Revenue (\$ thousands)	\$3,500	\$6,000
- Annual Growth		71%
- Number of Employees	16	80

3. CURRENT PRODUCTS

- Digital produces the industry standard CP/M-80 and CP/M-86 operating system, the multi-user operating system, MP/M II, and a source code conversion program called XLT-86.
- CP/M-80 was first installed in June 1975, and as of June 1982, Digital Research reports approximately 350,000 installations. CP/M-80 can be installed on any Intel 8080/8085, Zilog Z-80, or compatible microprocessor system with a minimum of 20K-bytes of main memory. Diskettes are required for backup memory. CP/M-80 sells for about \$135.
- CP/M-86 was first installed in January 1981, and while Digital is unable to approximate the number of installations, CP/M-86 is sold to over 40 OEMs, is sold directly from Digital, and is distributed within a 300-dealer network. CP/M-86 is available for the Intel 8086/8088 microprocessor system with a minimum of 32K-bytes of main memory. Diskettes are required for backup storage. CP/M-86 sells for about \$250 with documentation.
- MP/M-II is an 8-bit multitasking operating system which incorporates file-and record-locking, password protection, and increased disk-handling capacity. MP/M-II also permits 16 logical drives on-line simultaneously, and each drive has a capacity of as much as 512 M-bytes. A total of 4 G-bytes of on-line storage is therefore available to the user. MP/M-II will run on any Z80, 8080,



or 8085-based system and can manage up to 400K-bytes of user memory, although it only takes up about 16K-bytes. MP/M-II costs about \$450.

- XLT-86 is an analytical translator program written in PL/I-80. It reads the entire 8080 source program, assembles it to machine code, analyzes the register, memory, and flag utilization, and emits an optimizd 8086 assembly language program. The XLT-86 sells for \$150. The system requirements are:
 - 8080/Z80-based systems.
 - CP/M 1.4 or 2.2 or MP/M or MP/M-II.
 - 40K RAM.
 - One disk drive.

4. DISTRIBUTION CHANNELS

- According to Digital Research, 80% of its products are sold through OEMs like IBM and Altos. The remaining 20% are sold by manufacturer-direct selling and by a network of 300 dealers.

5. FUTURE DIRECTION

- Digital plans to introduce MP/M-86, the 8086 compatible version of MP/M-80. MP/M-86 will be competing against the UNIX system in the 16-bit market-place.
- Digital is in the process of creating an extensive distributor network for its products. For example, during December 1981 Digital consummated a deal with the world's largest distributor of electronic parts, Hamilton-Avnet.



F. SOFTWARE PUBLISHING CORPORATION

1901 Landings Drive
Mountain View, CA 94043
(415) 962-8910

1. BACKGROUND

- Software Publishing Corporation's Personal Filing System (PFS) is second only to VisiCalc as the all-time best seller with 70,000+ packages sold to date.
- Software Publishing Corporation was founded in 1980 by Fred Gibbons. In the company's first year its revenues were \$1 million.
- The products and the company's objectives are directed at the novice and the first-time user of personal computers.
- During May 1981 Melchor Venture Management supplied \$250,000 of capital to Software Publishing. During May 1982 Melchor Venture Management and others again supplied venture capital to Software Publishing.

2. GROWTH

	<u>1981</u>	<u>1982*</u>
- Total Company Revenue (\$ millions)	\$ 1	\$ 4
- Annual Growth Rate (percent)		300%
- Number of Employees	8	25 (as of 6/1)

* Estimate

3. CURRENT PRODUCTS

- PFS is Software Publishing's top selling software package with more than 70,000 units. PFS is an information management product which works like a



paper-filing system. PFS allows the end user to record, file, retrieve, and summarize information very quickly. PFS was introduced in September 1980.

- PFS: REPORT is the report generator for PFS, introduced in May 1981.
- PFS: GRAPH is a graphics package that is compatible with PFS and VisiCalc. It was introduced in May 1982.
- Systems requirements:
 - All three PFS products operate off UCSD PASCAL and the Apple II and III personal computers.
 - 48K RAM is minimum.
 - PFS and PFS: GRAPH need only one disk drive.
 - PFS: REPORT requires a dual disk configuration.
- The systems prices are:

	<u>Apple II</u>	<u>Apple III</u>
- PFS	\$125	\$175
- PFS: REPORT	\$ 95	\$125
- PFS: GRAPH	\$125	not offered yet

4. DISTRIBUTION CHANNELS

- Software Publishing's products are sold through Apple authorized dealers. About 75% of the PFS systems are sold to distributors.



5. FUTURE DIRECTION

- To obtain more product distribution control from distributor to dealer, SP is making some restrictive changes (complete details are not available). SP is contracting manufacturing representatives to sell their products directly to dealers, as one measure.
- SP will be offering its products on machines which are top sellers. Tandy and IBM versions are likely to be available in late 1982 or early 1983.

G. SORCIM CORPORATION

405 Aldo Avenue
Santa Clara, CA 95050
(408) 727-7634

I. BACKGROUND

- Richard Frank and Paul McQueston began in 1976 as a consulting company designing software for individual clients. In 1980 Frank and McQueston created Sorcim Corporation, a microcomputer software company. Perhaps Sorcim's greatest strength lies in its abundance of highly experienced technical programmers. Sorcim is a privately held corporation.
- Sorcim Corporation has received venture capital from Melchor Venture Management.



2. GROWTH

	<u>1981</u>	<u>1982*</u>
- Total Sorcim Revenue (\$ millions)	\$1.5	\$3.0
- Annual Growth Rate (percent)		100%
- Number of Employees	25	50 (as of May 1982)

* Estimate

3. CURRENT PRODUCTS

- SuperCalc is an electronic spreadsheet which allows development of financial and engineering applications without knowledge of a programming language. SuperCalc requires CP/M-80-2.2 or MS-DOS for 8-bit machines and will soon be available on CP/M-86. A minimum of 48K RAM memory and dual diskettes are needed as well. SuperCalc's price is \$295.
- PASCAL/M is a compiler which generates compact P-code. PASCAL/M features CP/M compatible I/O strings extensions similar to UCSD PASCAL, segmented procedures which allow memory saving overlays, external procedures which enable use of machine language routines, 600 lines/minute compilation speed, 14-digit BCD arithmetic, full-floating point, and a symbolic debugger. PASCAL/M is designed for the 8080 and Z-80 microprocessors and requires CP/M-80-2.2, and 56K RAM memory. PASCAL/M costs \$395.
- A.C.T. is a cross-assembler family which allows a user to assemble source code for a variety of processors. Assembly speed is greater than 1,000 lines per minute, and output is Intel format hex file.
 - The A.C.T. processor families include:
 - A.C.T. 65 - 6502, Mostek mnemonics.



- A.C.T. 68 - 6800/6801, Motorola mnemonics.
- A.C.T. 69 - 6809, Motorola mnemonics.
- A.C.T. 80 - 8080-8085/Z-80, Intel 8080 mnemonics, Sorcim superset of 8080 mnemonics for Z-80.
- A.C.T. 86 - 8086/8088, Sorcim mnemonics.

- Each assembler runs under CP/M, CDOS and requires one disk drive and 24K RAM memory.

- Trans 86 is a code translator which specifically translates 8080/Z80 source code to 8086/8088 source code. Trans 86 requires CP/M, one disk, and 48K RAM. Trans 86 costs \$125.

4. DISTRIBUTION CHANNELS

- Sorcim relies on distributors, dealers, and mail order as its primary means of product distribution.
 - Sorcim's major dealer is Computerland.
 - Sorcim has 30 distributors, some of which are Leading Edge, Hamilton-Avnet, Byte, CPU, Computer Innovation.

5. FUTURE DIRECTION

- Sorcim will be making an effort to support a larger variety of processors with its software product offerings.
- Sorcim plans to introduce a word processing system called Super Writer. Super Writer will offer automatic spelling check, mailing and merging, and full



editing capabilities. Super Writer will be available on 8086/MS-DOS machines with dual disk at \$395.

- Sorcim also plans to enlarge its dealer/distributor network significantly.

H. SOFTSEL COMPUTER PRODUCTS, INC.

8295 South La Cienega Blvd.
Inglewood, CA 90301
(213) 670-9461

1. BACKGROUND

- Softsel is the largest independent "software only distributor" for personal computers in the world today.
- Softsel was incorporated in October 1980 by Bob Lefs and Dave Wagman (Chairman of the Board).
- Softsel began, literally, as a part-time garage organization and has grown without investment ever since. Softsel is wholly owned as a private company by Mr. Lefs and Mr. Wagman.

2. GROWTH

- In its first year of business Softsel registered \$15 million in sales.
- Until now, Softsel has grown at a rate greater than 100% per quarter over 20 months.
- Softsel began in 1980 with two employees and now has 70.
- Softsel is anticipating \$25 million in revenue for fiscal year 1982.

